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MEDLEY FARM SITE
GAFFNEY, SOUTH CAROLINA

REMEDIAL DESIGN AND REMEDIAL ACTION

OPERATIONS AND MAINTENANCE MANUAL

May 1993

Prepared for the
Medley Farm Site Steering Committee

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PREFACE

A set of drawings has been developed to accompany this submittal. These drawings are referenced by title and number in the Table of Contents following this page.

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List of Drawings

ACRONYMS AND ABBREVIATIONS

BAQC	Bureau of Air Quality Control
BOD_5	5 Day Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
g	gram
gal	gallons(s)
gpd	gallons per day
gpd/sq ft.	gallons per day, per square foot
gpm	gallons per minute
GWS	Graphic Work Station
hp	horsepower
IWC	Instream Waste Concentration
kWh	kilowatt hour(s)
L	liters
lb/day	pound(s) per day
mg/L	milligrams per liter
mgd	million gallons per day
mil.gal	million gallons
NPDES	National Pollutant Discharge Elimination System
PLC	Programmable Logic Controller
psi	pounds per square inch
RD/RA	Remedial Design/Remedial Action
ROD	Record of Decision
rpm	revolutions per minute
SC DHEC	South Carolina Department of Health and Environmental Control
SOW	Scope of Work
sp gr	specific gravity

ACRONYMS AND ABBREVIATIONS (Continued)

sq ft	square foot (feet)
SVE	soil vapor extraction
SVOC	Semi-Volatile Organic Compound
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TSS	Total Suspended Solids
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
VMW	Vapor Monitoring Well
VSS	Volatile Suspended Solids

DOCUMENT CONTROL SHEET

GROUND WATER AND SOIL TREATMENT SYSTEMS OPERATIONS, MAINTENANCE, AND TRAINING MANUAL

MEDLEY FARM SITE GAFFNEY, SOUTH CAROLINA

Revision No.	Issue Description	Issue Date
0	Working Copy - Issued for Review	May 28, 1993
1	Working Copy - Issued for Review	June 8, 1993

Section 1
INTRODUCTION

1.1 Purpose of Manual

The purpose of this document is to summarize and document the operations and maintenance (O&M) tasks required to effectively operate the soil and ground water treatment systems to be constructed and operated at the Medley Farm Site. It is also the intent of this document to provide information concerning health and safety, routine monitoring, and troubleshooting activities.

The O&M Manual is a major project deliverable and milestone called for in the Remedial Design Schedule, Consent Decree, and Scope of Work (SOW). This manual provides the United States Environmental Protection Agency (US EPA) and South Carolina Department of Health and Environmental Control (SC DHEC) with the operations and maintenance responsibilities, details about site design considerations, vendor supplied O&M Manuals, and specifications for the Medley Farm Site. This document contains the technical basis for site O&M activities as they relate to start up, shut down, and maintenance of the soil and ground water treatment systems. Following approval of this document by the US EPA, RMT will finalize work upon the next significant project milestone for the Remedial Design/Remedial Action (RD/RA), the Final Design Report.

1.2 Scope of Work

Items delineated by the US EPA's Scope of Work document requires that the O&M Manual include the following:

- Equipment start-up and operator training;
- Description of normal operations and maintenance;
- Description of potential operating problems;
- Description of routine monitoring and laboratory testing;
- Description of alternate O&M;
- Description of equipment;
- Description of adequate safety precautions to be followed; and
- Identification of records and reporting mechanisms required.

This O & M document has been prepared to address these requirements. For reference, see Task IV, pages 27-28 of the SOW.

1.3 Background

On May 29, 1991, the United States Environmental Protection Agency (US EPA) issued its Record of Decision (ROD) for the Medley Farm Site. This document set forth the Agency's rationale and selected remedy for addressing affected ground water and soils identified at the site. The US EPA's Medley Farm ROD was based on the findings of the Remedial Investigation/Feasibility Study (RI/FS) conducted by the Settling Defendant's technical consultant, Sirrine Environmental Consultants, Inc. On October 9, 1991, the Settling Defendants for the Medley Farm Site (hereinafter referred to as the Medley Farm Site Steering Committee) formally entered into a Consent Decree outlining the basis for Remedial Design and Remedial Action at the site. The Consent Decree was formally entered with the United States District Court on January 17, 1992. The members of the Medley Farm Site Steering Committee have jointly agreed to implement the remedy defined by the ROD, the Consent Decree and Scope of Work (SOW), which is a part of the Consent Decree. The ROD and SOW comprise the primary technical resource documents that have been used during the development of this document.

RMT, Inc. (RMT) was retained by the Medley Farm Site Steering Committee to develop and implement the ROD-selected remedy. As a part of the required project deliverables, RMT prepared and submitted the Pre-Final/Final Remedial Design Report to the US EPA and the SC DHEC for review and approval. This document described the general approach and schedule for completion of the Remedial Action portion of the RD/RA. The Pre-Final/Final RD Report for the Medley Farm Site was submitted to the US EPA and SC DHEC on May 28, 1993.

This O&M Manual is one of the major project deliverables called for under the approved RD project schedule. The Medley Farm SOW outlines (on pages 27-28) specific US EPA technical requirements concerning the content of this document. This O&M Manual has been prepared in accordance with the requirements of the Medley Farm ROD, Consent Decree, SOW and RD Work Plan.

1.4 Regulatory Requirements - RD/RA Consent Decree

Section VI.11.f (Page 17) of the Medley Farm Consent Decree requires that the Prefinal/Final Design Report include, at a minimum, the following: (1) final plans and specifications; (2) a final construction schedule; (3) operation and maintenance plan; (4) field sampling plan (directed at measuring progress towards meeting Performance Standards); and (5) contingency plan. This O&M Plan is submitted in compliance with this requirement.

1.5 Treatment System Description

RMT's conceptual process design for the Medley Farm Site remedy generally consists of a portable soil vapor extraction (SVE) system for treatment of the VOC-affected soils, a system of jet-pump ground water extraction wells for removal of VOC-contaminated ground water, a low profile air-stripping unit for treatment of the affected ground water, and a diffuser system for discharge of the treated ground water through a NPDES-permitted outfall to Jones Creek.

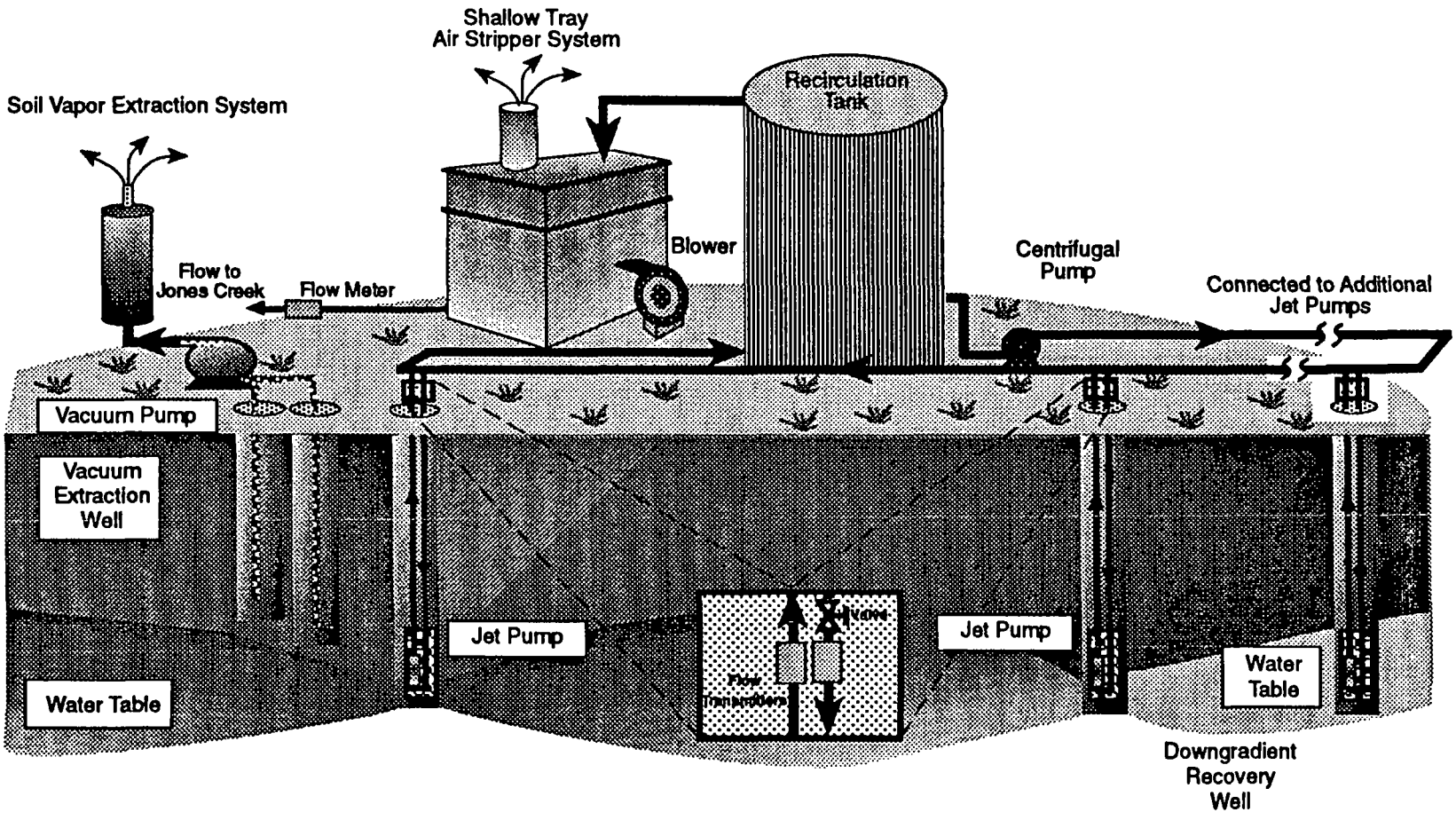
A more detailed process narrative for each of the ground water treatment and soil vapor extraction systems is provided in Sections 1.5.1 and 1.5.2. At this time, the design criteria for each of these systems is based upon the assumption that air emissions from both the ground water and soil removal systems will not require treatment to achieve minimum SC DHEC air quality requirements, per a letter from SC DHEC's Bureau of Air Quality Control dated December 29, 1993 (Appendix A).

1.5.1 Ground Water Recovery and Treatment System

Ground Water Recovery

Dual jet pump collection systems (Systems A and B) have been selected for use at the Medley Farm Site. Each of these systems is intended and designed to function independently of one another. Yet, they both are intended to collect ground water from within a discrete portion of the plume of VOC constituents. A generalized arrangement of the Medley Farm remedy is shown in Figure 1-1.

The remedial design for the Medley Farm Site has been developed to accommodate a degree of flexibility with respect to possible changes and modifications that may become necessary in response to changing site conditions or remedial objectives. A review of the text and drawings provided herein will illustrate the provision for a third jet pump system (reference Drawing 938-



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Engineering and Environmental Management Services

FIGURE 1 - 1

Conceptual Process Approach

MAY 1993

Medley Farm Site
Gaffney, South Carolina

C03), should the need arise. At this point in time, dual jet pump systems A and B are believed to be adequate to address the site remedial objectives. The third system (System C) is shown only to emphasize the fact that the remedial design does take future contingency measures into account.

A jet pump recovery system is intentionally designed as a reliable and uncomplicated means of extracting ground water from the subsurface and conveying it to a centralized treatment system. The most important components of a jet pump system are the centrifugal pump (prime mover), the jet pump ejector, and the associated piping. Figure 1-1 provides a conceptual view of these various components as they interact with one another. The jet pump ejector is installed near the bottom of each pumping well. Each pumping well will be constructed as shown in Figure 1-2. Seven (7) recovery wells will be used in System A and four (4) in System B. The prime mover for each system is used to maintain a minimum flow of water through the ejector, which in turn exerts a negative pressure or suction on the ground water present in the well. The momentum transfer that occurs within the ejector's venturi assembly imparts a vacuum of sufficient strength to induce flow out of the well and into the collection piping.

This type of ground water extraction system is reliable, cost effective, and does not require complicated control systems. In cases where the well is pumped to dryness, the jet pump merely draws air into the system which is vented elsewhere. To facilitate long-term system operations and monitoring, RMT has found it useful to include flow meters, check valves, and throttling valves at select locations throughout the system. A general process flow diagram for the jet pump ground water extraction system at the Medley Farm Site is presented in Drawing 938-C04.

Recirculation System

The dual jet pump extraction systems for the Medley Farm remediation will hereinafter be referred to as System A and System B, respectively. As one examines the Process Flow Diagram (PFD) Drawing 938-C04, it should be noted that both Systems A and B are each provided with a dedicated centrifugal pump. Each of these two systems share a central recirculation tank shown on the PFD. This central recirculation tank serves as the point of suction for both prime movers and provides the water supply necessary to maintain the

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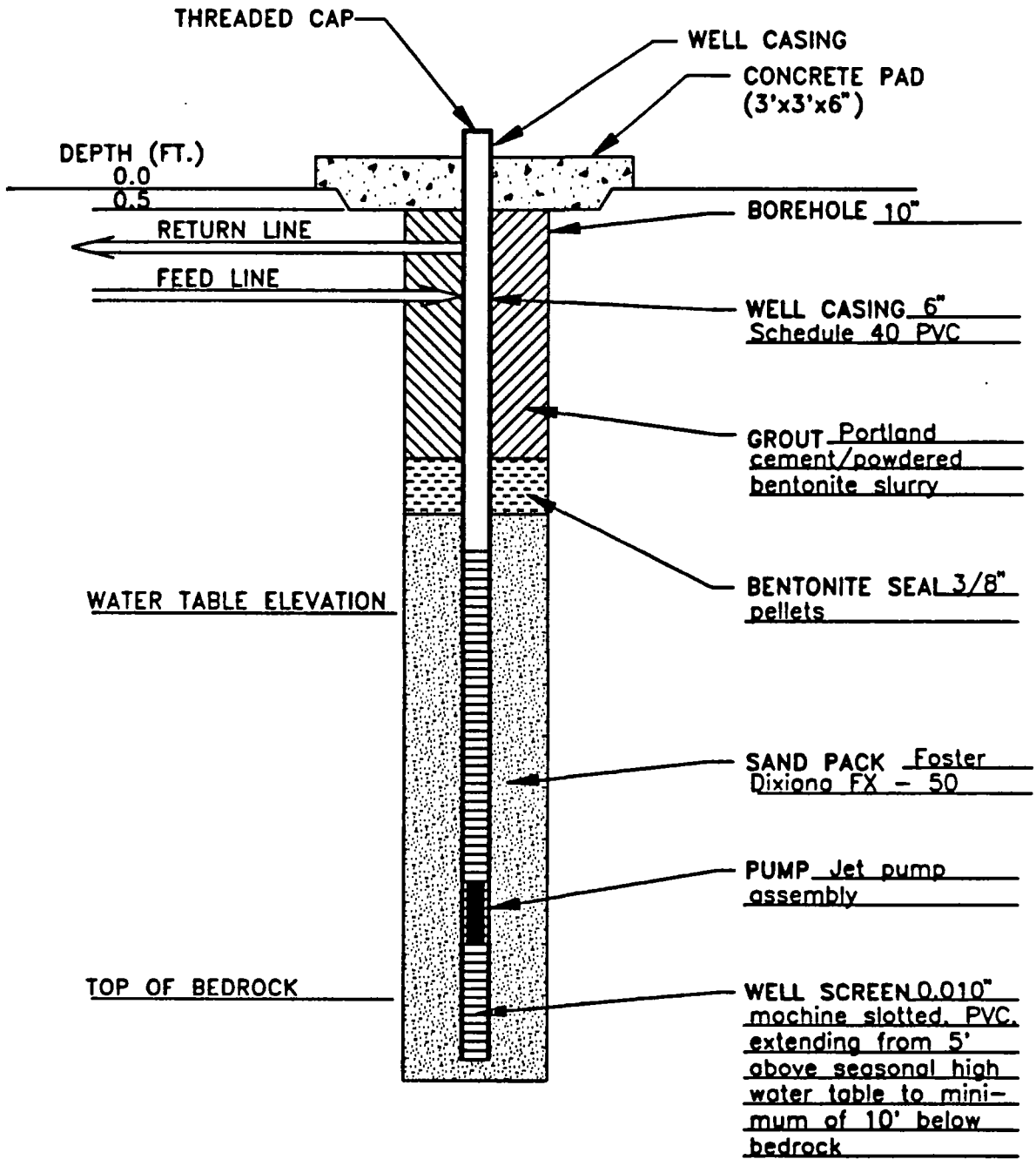

FIGURE 1-2

GROUND WATER EXTRACTION WELL CONSTRUCTION SCHEMATIC

Not To Scale

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minimum water flow throughout each of the respective ground water recovery systems. The accumulated discharge from all of the jet pump extraction wells recirculates out through each system and returns with the additional water collected from each extraction well. As the water level increases, the recirculation tank is provided with an overflow through which the excess return water flows by gravity to the low-profile air stripping system.

Low-Profile Air Stripper

The extracted ground water overflows the recirculation tank and flows by gravity to the top of the low-profile air stripper unit (Figure 1-3). Once here, the water flows across the upper distribution tray of the air stripper where it is uniformly distributed over a pattern of 3/16-inch diameter holes through which a continuous stream of air is passed. The extracted ground water then drains by gravity through three trays to a sump located at the bottom of the air stripper. As the extracted ground water passes downward through these trays, an air stream is continuously forced upward through the ground water by an air blower.

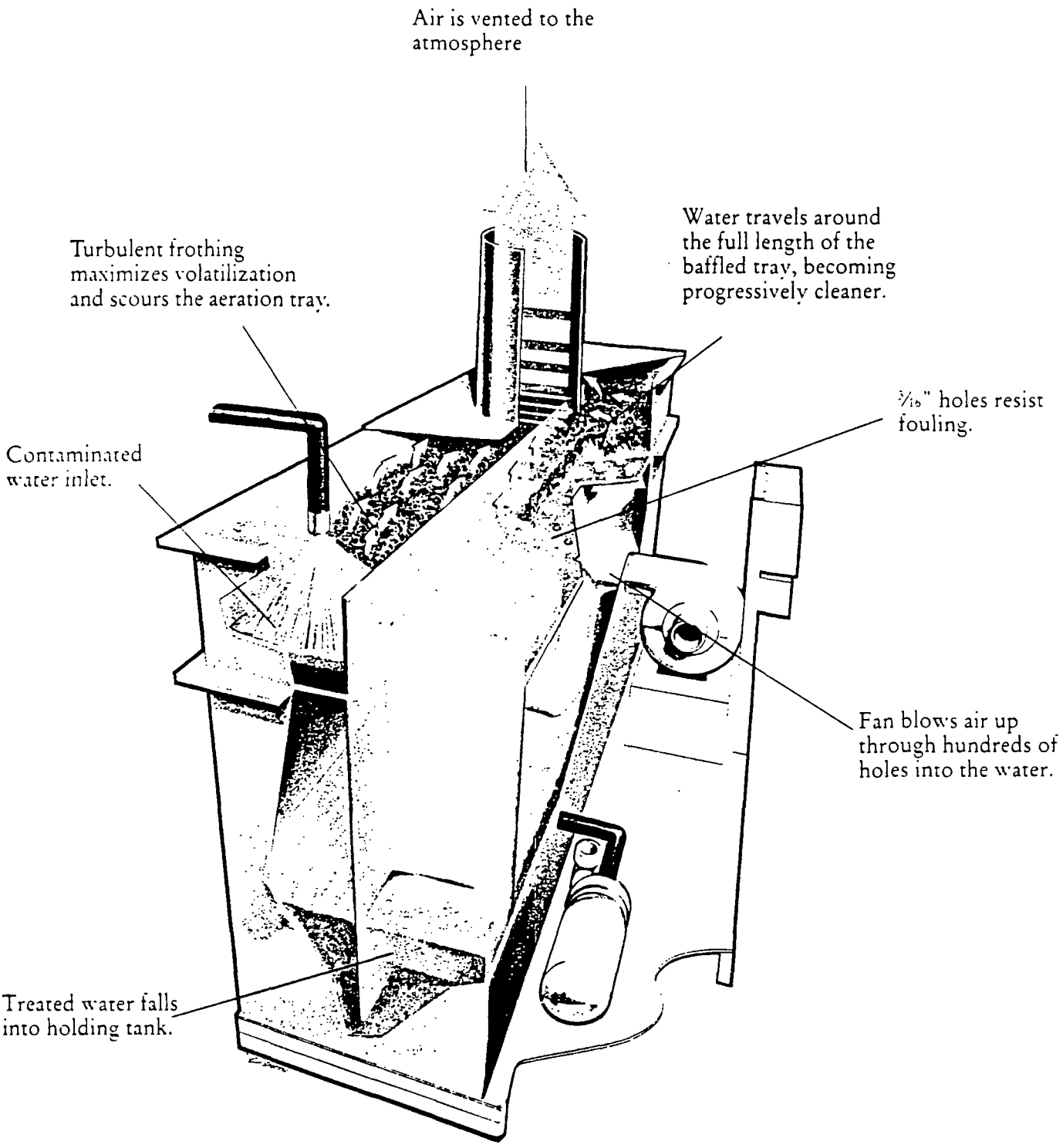
This counter-current flow of extracted ground water and air induces mass transfer of VOCs from the ground water and into the air stream. The VOCs are stripped from the water phase and introduced to the air phase. Treated ground water will flow by gravity from the low-profile air stripper through a flow-measuring flume and on into the discharge diffuser at the NPDES outfall (OSN 001) in Jones Creek.

1.5.2 Soil Vapor Recovery System

Soil vapor recovery will be used to remediate unsaturated zone (vadose zone) soils in three areas designated by the Record of Decision (ROD) and shown on Drawing 938-C05. These areas of the site were identified during the RI/FS as having the potential to provide a long term source of VOC to the ground water.

Soil Vapor Extraction (SVE) Wells

A series of vapor extraction wells are installed within each area described by the ROD and piped to a central vacuum pump by way of a common header. The arrangement for this system is shown on Drawing 938-C05. Figure 1-1 also depicts the general manner in which vapor extraction wells are intended to relate to ground water extraction wells. Soil vapor



PHOTOGRAPH TAKEN FROM SHALLOW TRAY AERATION SYSTEM (NORTH EAST ENVIRONMENTAL PRODUCTS, INC.)

FIGURE 1-3

LOW-PROFILE AIR STRIPPER

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GAFFNEY, SC

extraction wells will generally be installed approximately ten feet above the mean high ground water elevation. A typical construction diagram for a soil vapor extraction well is shown on Figure 1-4.

Soil vapor extraction wells will be constructed using two-inch schedule 40 PVC piping. The screened interval for these wells will be approximately ten feet above the mean high water elevation to the surface. The screens for the soil vapor extraction wells will be 30 feet in length and will be 0.020-inch continuous slotted. Treatability test results indicate that a system of eight soil vapor extraction wells will be necessary to address the required vapor extraction operations designated by the ROD. The process flow diagram for this system is shown on Drawing 938-C04. System details are provided on Drawing 938-C11.

Generally, the vapor extraction wells are piped into a central header which leads to the centrally-located vacuum unit. The vacuum piping will be placed in a shallow trench to address the potential for vandalism. In areas of known vehicular traffic, the vacuum piping may also be protected by a steel casing to prevent crushing. As a vacuum is applied to the site soils, recovered vapors will flow through the four-inch pipe header, into the vacuum unit and then discharged to the atmosphere. The vacuum header is installed at a continuous grade to prevent condensate from accumulating in the pipeline. In this manner, condensate not collected by the condensate trap should flow back to the nearest SVE well.

The vacuum unit utilized for the Medley Farm Site remediation is pre-engineered, prefabricated, trailer-mounted, and piped and wired by the vendor. The major components of this system are described below. The technical specifications for this system have been provided in Section 3.6.2 of the Pre-Final/Final Design report.

Vacuum Monitoring Wells

Purpose - To monitor the influence radius, at various depths and locations, of the SVE vacuum wells.

Description - One-inch vacuum monitoring wells (VMWs) are installed to monitor the influence radius of the SVE wells at various depths and locations. The depths of these wells may be installed up to 10 feet above the seasonal high water table. The construction details of the

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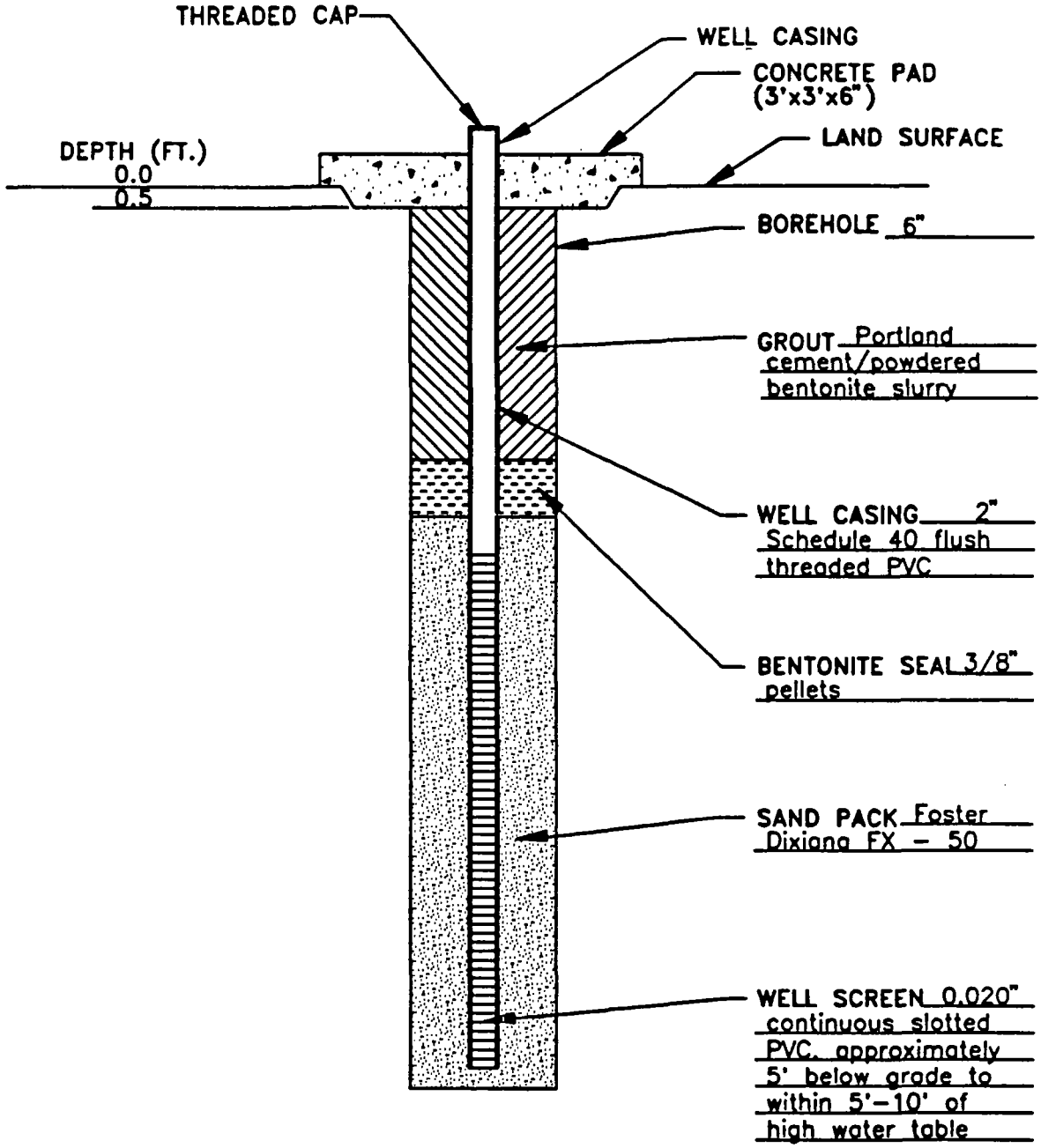

FIGURE 1-4

SOIL VAPOR EXTRACTION WELL SCHEMATIC

Not To Scale

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VMW's is shown on the following Figure 1-5. Each well will be screened using 0.010-inch machine slotted construction to within 10 feet of the high water table. The data collected from these VMW's will be used to enhance the optimum performance of the SVE system and monitor its effectiveness.

Condensate Trap

Prior to entering the vacuum unit, extracted soil vapors first pass through a condensate trap. The purpose of this unit is to remove entrained water vapor from the air stream before it passes through the vacuum pump. Water will collect in the bottom of this trap as time progresses. A high level shut-down will address situations where too much condensate has collected. A drain will be manually opened to periodically remove this water from the SVE system. This water will be periodically discharged to the recirculation tank of the air stripping unit for treatment prior to discharge to the Jones Creek NPDES outfall, OSN 001.

Air Filter

The soil vapor will then pass through a high efficiency particulate filter to remove fine particle solids prior to their entry into the vacuum unit. Pressure gages located upstream and downstream of the unit will be used to monitor the pressure drop across the filter.

Air Intake

Make-up air is provided through a filtered air intake. A globe valve is positioned on this line to precisely regulate the amount of make-up air that is fed into the system. A flow meter and pressure gage are situated upstream of this globe valve to monitor intake conditions. Make-up air is necessary for starting the vacuum system under no-load conditions and to operate the system at variable levels of vacuum and vapor flow.

Inlet/Discharge Silencers

In-line silencers are installed on both the inlet and discharge sides of the vacuum pump. Vacuum pumps of the size used for SVE operations can be noisy, so silencers are used to reduce the noise level during site operations. RMT limited the hours of operation for the SVE system to daylight hours. This approach limits the potential for nuisance noise levels at the site by placing a timer control on the power feed for the SVE system.

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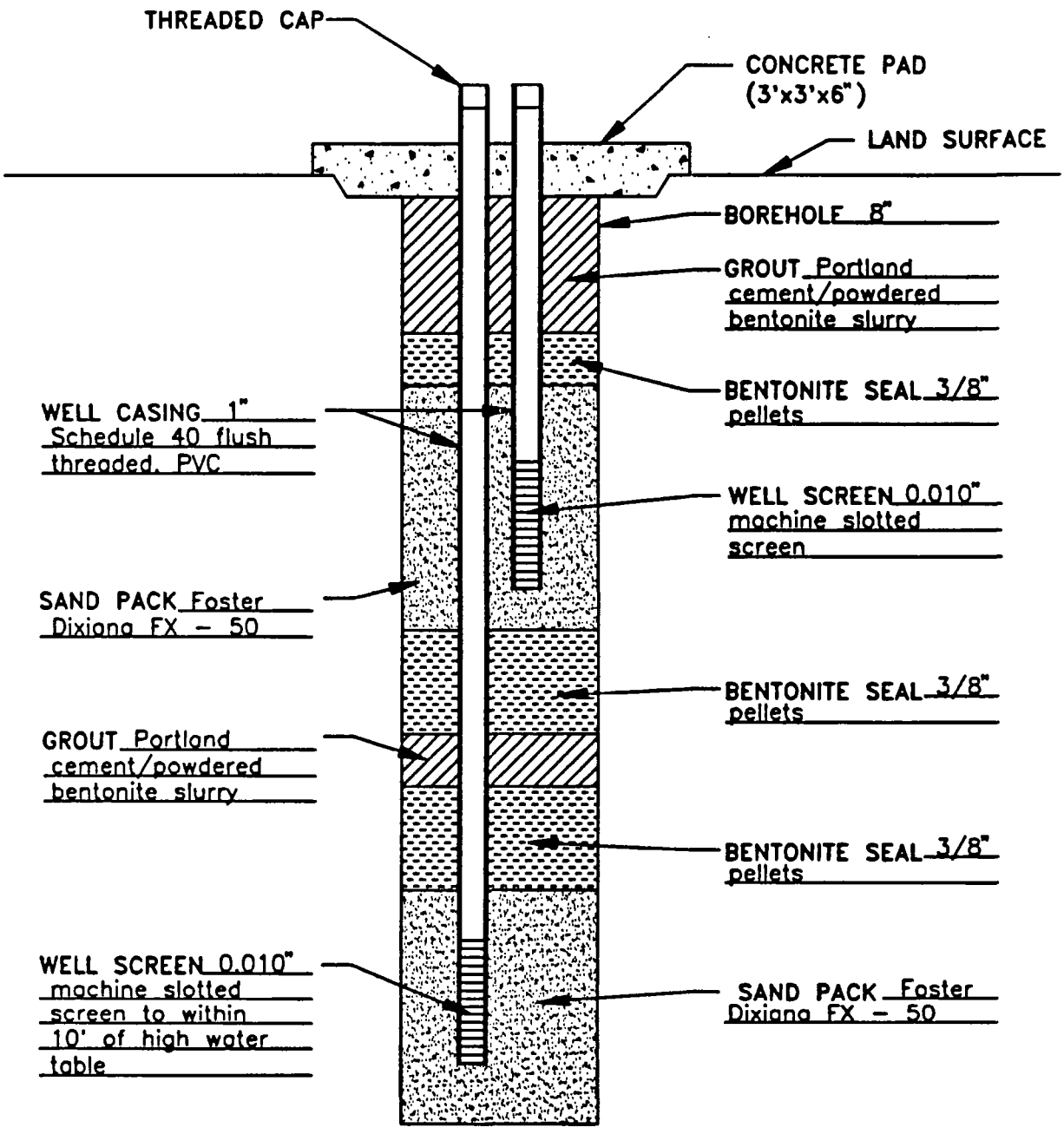

FIGURE 1-5

VACUUM MONITORING WELL SCHEMATIC

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Vacuum Pump

The vacuum pump will be a rotary lobe, positive displacement pump capable of providing at least 500 SCFM under no load conditions, and capable of operating up to a vacuum of 190 inches of water (14 inches mercury). The design operating vacuum is 140 inches of water (10.3 inches mercury).

A vacuum relief valve will be located immediately upstream of the vacuum pump. A temperature sensor will be located immediately downstream of the vacuum pump. If discharge temperature exceeds normal operating temperature, the temperature sensor will transmit a signal to the control panel and pump operation will cease. A high level signal from the liquid level sensor in the condensate trap will also cause the vacuum pump to shut down. A temperature indicator and a pressure gauge on the discharge piping will allow the operator to monitor the physical conditions of the air discharge stream.

Discharge Stack

Recovered soil vapors and make up air will be discharged to the atmosphere through a 15-foot high discharge stack. The materials of construction for this stack will be six-inch schedule 40 PVC pipe. A sampling port will be located at the appropriate location of the stack for sampling the discharge stream, if required. [Refer to Method 2A guidelines 40 CFR Part 60, Appendix A]. At this time, SC DHEC has waived the requirements for a BAQC Air Permit as stated in the letter shown in Appendix A.

1.6 Design Conditions and Prescribed Treatment

The design conditions and prescribed treatments have been developed to address the technical and regulatory issues and objectives defined by the US EPA's Record of Decision (ROD) and Statement of Work (SOW) developed for the Medley Farm site. The site's characteristics have been assessed and along with the issues and objectives set forth by the ROD and SOW, they provide the foundation for RMT's design developed and implemented.

The design conditions taken into account include the following items:

- Efficiency of VOC removal from ground water and soil vapor to meet SC water and air quality standards;
- Horizontal and vertical control points for the remediation zones of work;
- Earthwork;
- Roads;
- Storm drainage;
- Erosion control;
- Noise control;
- Automatic and manual control flexibility;
- Centralized systems monitoring and alarms;
- Outdoor operations;
- Security;
- Maintenance.

Specific and detailed descriptions of the design conditions are fully described in RMT's Pre-Final/Final Remedial Design Report issued May 28, 1993. Some of the major design conditions related specifically with the operation and maintenance of the remediation systems are summarized as follows:

1.6.1 Ground Water Extraction Wells and Air Stripper

- Ground water extraction wells are installed to ten foot minimum depths within competent bedrock. Eleven ground water extraction wells are scheduled for operation (Seven for System A and four for System B).
- Ground water extraction wells are constructed of six-inch Schedule 80 PVC to facilitate installation of jet pump assemblies.
- Feed and return lines to extraction wells are to be constructed below grade to minimize concerns for vandalism.

- Exposed piping, pumps, and valves will be heat traced and insulated to minimize freezing during winter operations.

- Jet pumps will be installed at the theoretical depth of maximum drawdown such that the net suction head is zero.

- Jet pumps are designed to push the design flow against the maximum head from the respective jet pump location to the recirculation/accumulation tank with a net positive suction head of zero.

- Measurements of flow from each well will be provided by a flow transmitter and flow recorder device for each recovery well.

- Centrifugal pumps for systems A and B are sized to pump the total flow required to achieve desired ground water extraction rates, any additional incremental flow recovered from each well, and a minimum circulating flow of 25 gpm.

- The recirculation/accumulation tank is sized to hold 110% of the total volume of piping anticipated to be in service.

- The equipment and pump pad location is secured by a six-foot security fence topped with three strands of barbed wire.

- The air stripper is capable of treating water at flow rates of up to 270 gpm for ground water temperatures of 16 to 18° C. The equipment, power, controls, and instrumentation are designed for outdoor conditions.

- VOC effluent concentrations from the air stripping unit are designed to meet Water Quality Criteria (WQC) limitations established in the draft NPDES permit issued by SC DHEC (Permit No. SC0046469). No air permit is required by this system as shown in the SC DHEC letter in Appendix A (December 29, 1992 Permit Waiver).

- Maximum efficiency of the treatment system is obtained when affected ground water is introduced to the air stripper evenly over the three aeration trays, inducing turbulent frothing of the ground water and maximizing volatilization of the dissolved VOCs. The system is designed to meet the draft NPDES permit limitations for the treated effluent.

- A summary of the draft NPDES permit limits are as follows:

Summary of Limits

Pollutant	Draft NPDES Permit Limitations
1,2-Dichloroethane	28.5 µg/l or 0.028 mg/l
1,1-Dichloroethene	39.9 µg/l or 0.039 mg/l
Tetrachloroethene	72.8 µg/l or 0.072 mg/l
BOD_5	10 mg/l monthly average 20 mg/l daily maximum
pH	6.0 to 8.5
Biological Monitoring (Whole Effluent Chronic Toxicity)	Monitor and Report
Flow	Monitor and Report

1.6.2 Soil Vapor Extraction System

- Two-inch soil vapor extraction (SVE) wells are located at eight locations in the three areas specified by the ROD. The SVE wells are constructed of Schedule 40 PVC and are screened through the unsaturated soil zone to no closer than 10 feet of the seasonal high water table.

- One-inch vacuum monitoring wells (VMW) are installed to monitor the influence radius at various depths and locations during the SVE system operation to confirm the design basis. The depths of these wells may be installed up to 10 feet above the seasonal high water table.

- Vacuum lines are buried to minimize the potential for vandalism. The SVE manifold piping is sized to accommodate up to 50 percent more SVE wells than the number called for in the Pre-Final/Final Design Report.

- The SVE vacuum pump will deliver approximately 175 percent of the combined SVE well yields at the design vacuum. The design vacuum will, at a minimum, be operated at a vacuum pressure of 100 inches of water column.

- Silencers are provided on the air inlets and outlets to minimize noise.

- Monitoring systems are provided for sampling on the inlet and outlet of the vacuum pumps.

- The equipment, power connections, instrumentation, and controls are designed for use outdoors.

- No air permits are required for this system as set forth in the SC DHEC's Bureau of Air Quality Control (BAQC) permitting waiver.

1.7 Process Instrumentation and Control Approach

1.7.1 Ground Water Remediation System

Recovery Wells

There are seven Recovery Wells serving System A and four serving System B.

Located at each well is an inlet and an outlet flow indicating transmitter and an inlet pressure indicator.

Each well has a one minute rolling average flow recorded within the PLC (Programmable Logic Controller) for the most recent 60 minutes. These recorded values are accessible via modem by the GWS (Graphics Work Station) located at RMT Greenville.

Recirculation Tank T-1 (Refer to Drawing 938-C04)

The Recirculation Tank has level transmitter LIT-100 with its input into the PLC. Level switches LSL-100, LSH-100 and LSHH-100 are located within the PLC.

The PLC issues alarm's LAL-100A and LAHH-100A which are located on CP1 (Ground Water Recovery Control Panel).

Alarms LAL-100B and LAHH-100B are accessible via the modem by the GWS.

When low level in Tank T-1 is reached, LSL-100 will shut down Pumps P-100 and P-200.

If high-high level in Tank T-1 is reached, LSHH-100 will shut down Pumps P-100 and P-200.

When high level in Tank T-1 is reached and the Air Stripper Blower's HS-400 is in the auto position, LSH-100 will start Pumps P-100 or P-200 if HS-100 or HS-200, respectively, is in the auto position.

P-100 or P-200 runs anytime HS-100 or HS-200, respectively, is in the Hand position and LSL-100 senses that there is sufficient liquid level in Tank T-1.

Motor alarm MA-100A is located on CP1 and indicates that P-100 of System A is running.

Motor alarm MA-100B is accessible via the modem by the GWS and indicates that P-100 is running.

Motor alarm MA-200A is located on CP1 and indicates that P-200 of System B is running.

Motor alarm MA-200B is accessible via the modem by the GWS and indicates that P-200 is running.

Pressure indicators PI-100 and PI-200 indicate the respective outlet pressure of P-100 and P-200.

In the auto position of HS-100, HS-200 and HS-400, if FSL-400 is not sensing air flow into the Air Stripper within 10 minutes after B-400 is requested to start, B-400 will shutdown.

Air Stripper AS-1

Failed closed flow valves FV-200A, FV-200B and FV-200C are energized to allow flow from Tank T-1 into the Air Stripper when the Air Stripper Blower B-400 is running.

If HS-400 is in the auto position and high liquid level is reached in the Air Stripper, LAH-400 indicates and alarm on CP1 and shuts down B-400.

Alarm LAH-400B is accessible via the modem by the GWS and indicates high liquid level within the Air Stripper.

Air Stripper Blower B-400 is manually started via HS-400 and motor alarm MA-400A on CP1 indicates that B-400 is running.

Motor alarm MA-400B is accessible via the modem by the GWS and indicates that B-400 is running.

Flow switch FSL-400 senses the air flow into AS-1 and flow alarm FAL-400A on CP1 indicates a loss of air flow.

Alarm FAL-400B is accessible via the modem by the GWS and indicates a loss of air flow.

FSL-400 confirms that B-400 is running after 10 seconds of B-400 being told to start.

LSH-400, FSL-400 and PI-400 are furnished with the Air Stripper.

Outflow

Outflow of liquid will be measured with a Parshall Flume.

Flow indicating/totalizing transmitter FIT-500/FQ-500 sends its signals to the PLC.

Totalized flow FQI-500A is indicated on CP1 and is accessible as FQI-500B via the modem by the GWS.

Instantaneous flow FI-500A is indicated on CP1 and is accessible as FI-500B via the modem by the GWS.

High flow alarm FAH-500 is indicated on CP1 and is accessible as FAH-500 via the modem by the GWS.

FSL-500 indicates low flow to the diffuser.

Alarm FAH-500A will indicate on CP1 when there is low flow to the diffuser while B-400 is running.

Alarm FAH-500B is accessible via the modem by the GWS.

Emergency Modem Call Back

An emergency call will automatically be placed from the site to the RMT Greenville office if the following alarms occur:

When FAL-400A alarms.
Only one Pump of P-100 or P-200 is running.
FAL-500A alarms.

The Ground Water Remediation system is automated through the implementation of a programmable logic circuit (PLC). The PLC is equipped to shutdown the system in the event of a system malfunction. The PLC monitors flow in and out of the wells, level of water in the tank, conditions of the centrifugal pumps, level in the sump tank of the air stripper, air flow from the blower on the air stripper, and the treated water flow discharges to Jones Creek outfall, OSN 001. The PLC will shut the system down when any of these values, with the exception of the flow in and out of the wells, deviate out of their specified operating interval limits.

1.7.2 Soil Vapor Extraction System

The soil remediation system is automated through relays provided by the vendor. The system relays shut the system down in the event of a system malfunction. Monitored values include the water level in the condensate trap, the differential pressure across the inline filter, temperature of the gases downstream from the pump and the motor function of the vacuum pump. If any of these values deviate outside of their specified operating range limits the system will shut down. Another control feature is the control clock which limits operation of the system to daylight hours to control nuisance noise.

See the design control narrative provided in the SVE design package provided by the vendor.

1.8 Organization of Operations Management

The following Figure 1-6 shows the personnel and contact numbers for operations management at the Medley Farm Site.

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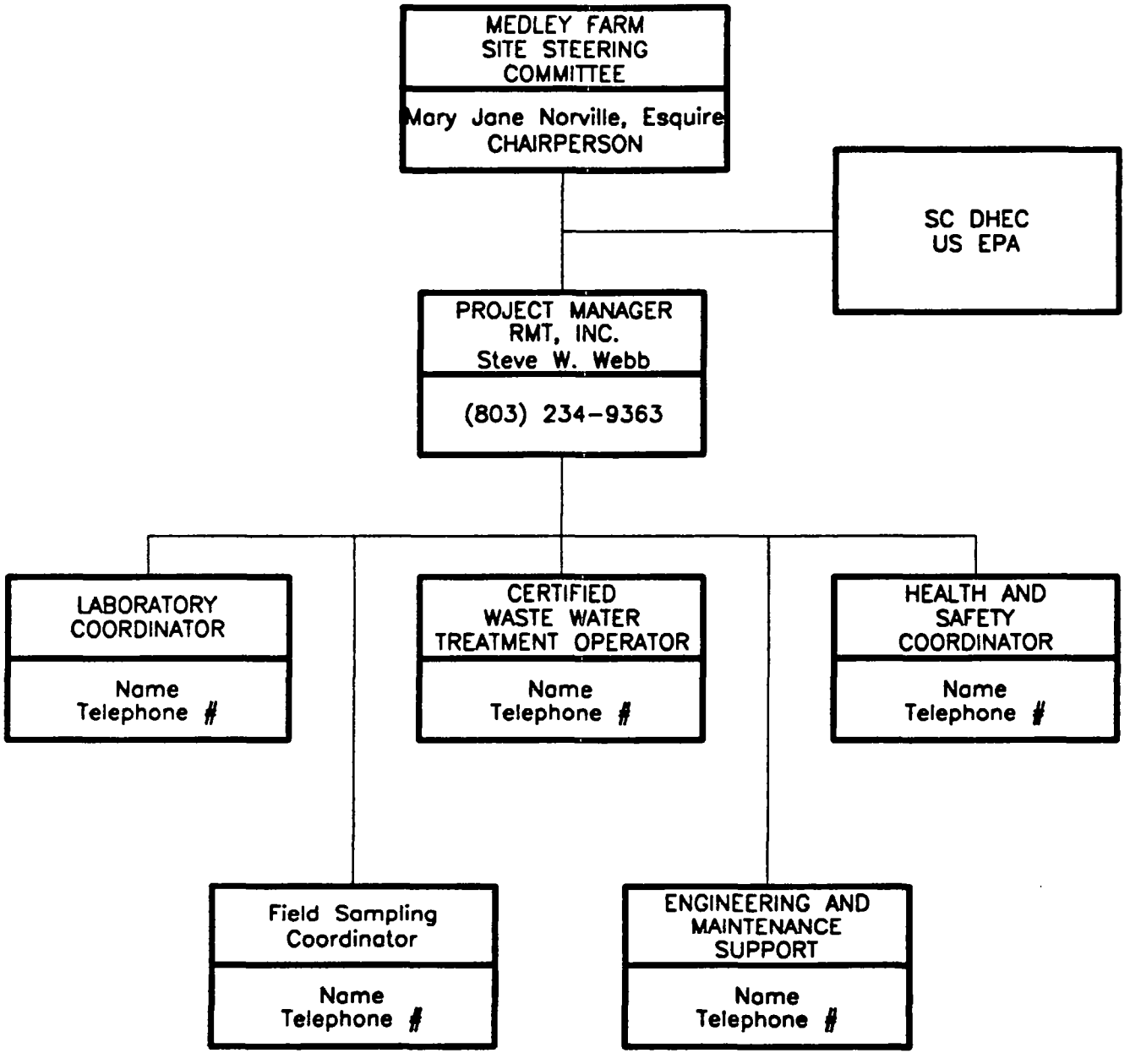


FIGURE 1-6
SECTION 1.8
ORGANIZATION OF
OPERATIONS MANAGEMENT

RMT, INC. 938.13
0593

MEDLEY FARM
GAFFNEY, SC

1.9 Training of Personnel

Personnel engaged in operating the treatment systems shall be certified and have a SC Class[1] Wastewater Treatment System Operator's license.

The treatment system(s) vendor shall provide a qualified representative during the initial start-up for training the operators in the various operations and maintenance activities specific to the system. Periodic operations and maintenance training may occur after startup in the case that changes to the treatment system are made.

The operators shall have at a minimum 40-hour health and safety training, along with the update refresher training. See Section 14 of the RMT Health and Safety Plan.

[1]The classification is to be determined by SC DHEC as stated in Part III.A.3 of the draft NPDES permit.

Section 2
OPERATION OF SYSTEMS

2.1 Ground Water Remediation System Description

2.1.1 System Description and Equipment

Extraction Wells for Systems A and B

Purpose - To remove ground water from the transition zone and bedrock and convey it to a centralized treatment system.

Equipment Description - Six-inch Schedule 80 PVC extraction wells have been installed to a minimum depth of ten feet within competent bedrock. Each well is screened from the bottom of the borehole to five feet above the observed water table. All screens are 0.01-inch machine-slotted. All in-ground materials are threaded, flush-joint PVC. Feed lines to the recovery wells are Schedule 80 PVC pipe and are installed underground. Construction connections are pitless adapters.

Piping within the pumping wells is Schedule 80 PVC and PVC industrial hose material. The hose material is high tensile cord reinforced to a maximum pressure rating of 250 psi and has a minimum bending diameter of nine (9) inches. All exposed piping, pumps, and valves are insulated.

The jet pump assembly for each well is a one (1)-inch brass unit located at the depth of maximum draw-down of each well. The location of each jet pump unit is designed to induce flow from out of the fractured bedrock.

All valves and meters within the piping system and in the wells are rated at 200 psi. The flow into and out of each well is measured and transmitted by a flow indicating transmitter (FIT) to the flow recording device. All transmitters are linked to the programmable logic circuit (PLC) and flows are recorded by a flow recorder (FR) provided at the Medley Farm Site, and linked by telephone modem to an off-site GWS. At this time, the off-site location for the GWS is envisioned to be RMT's Greenville, South Carolina office.

A pressure indicator is located on the inlet valve to each well. Ball valves are located on the inlet and outlet sides of each well. A check valve is located beneath the jet pump to prevent extracted ground water from flowing out of the extraction system back into the aquifer. Additional check valves are located immediately before the ball valve on the discharge side of each well to prevent extracted ground water from flowing back into the well head once it exits the recovery well.

The central return header of each well system (A and B) is also equipped with a turnaround system consisting of a ball valve followed by a check valve. The check valve serves to prevent the back flow of water from the recirculation/accumulation tank and the ball valve tends to force the flow of water out through each of the secondary pipe lines. Each return header is also equipped with a relief valve.

Operational Description - A centrifugal pump (prime mover) pumps water from the bottom of the recirculation tank through the piping system to the ground water well. The water flows down the well and across the jet pump venturi. The affected ground water is extracted from the aquifer by the momentum transfer and negative suction created by the jet pump. The extracted ground water then flows out of the well into the piping system (A or B) and into the recirculation/accumulation tank. The recirculation tank serves as the suction head for the prime movers. Any accumulated water in excess of the design capacity flows by gravity to the low-profile air stripper treatment system.

Theory of Operation - After the water from the centrifugal pump enters the jet pump it passes through a venturi located on the ejection port of the jet pump. The momentum transfer that occurs within the venturi imparts a vacuum of sufficient strength to induce flow out of the well and into the collection piping. The flow of newly extracted ground water joins the flow from the centrifugal pump in the outlet piping of the well. This combined flow is pumped by the force of the centrifugal pump out of the well and back to the recirculation/accumulation tank.

Recirculation/Accumulation Tank

Purpose - To accumulate water and serve as the suction head for the centrifugal pumps and provide the source of affected ground water for the air stripper unit.

Equipment Description - The recirculation/accumulation tank is constructed of fiberglass with an operating volume of 8000 gallons. This tank will be positively vented to the atmosphere and have an 18-inch manway. The tank data sheet for this unit is found in Appendix C.

Four ports exist in the tank. An inlet port from the extraction wells is located on the upper half of the tank. An overflow exit port is located near the top of the tank to direct affected ground water to the air stripper. The remaining two outlet ports are located near the bottom of the tank, both of these ports allow a minimum flow to the centrifugal pumps of System A and B.

The water level in the tank is monitored by a level indicating transmitter (LIT-100) with three (3) output relays as level switches (LSL-100, LSH-100, LSHH-100). The output from the transmitter operates two alarms if the tank volume reaches the preset level. The preset level alarms occur at LSL-100 and LSHH-100 corresponding to level alarm low (LAL) and level alarm high high (LAHH). The alarms are visually indicated at both the control panel and the observation site. Simultaneously, these outputs (LSL and LSHH) tie into the PLC which in turn sends a signal to shut down the centrifugal pumps. This action triggers a sequential shut-down of the air stripper.

Operational Description - Water extracted from System A and B wells is directed through the central header to the tank from ports located on the upper half of the tank. The water is accumulated in the tank and either overflows out to the air stripper to be treated or is drawn out by the centrifugal pumps to be used in further ground water extraction.

Centrifugal Pump

Purpose - Provide a supply of water to the corresponding system's extraction wells necessary to create the momentum transfer required by each well's jet pump assembly. The centrifugal pump provides the force for conveyance of the extracted water out of the well and on to the recirculation/accumulation tank.

Equipment Description - The pump specified for the treatment system is a Gould model 3196 MTX 2x3-10 A60 horizontal centrifugal pump rated for continuous service. The shaft diameter is 1-3/4 in. Each pump is connected to a motor alarm (MA-100A, MA-100B, MA-200A, MA-200B; [designated as 100 for system A and 200 for system B]) which is activated during any disruption of normal operating conditions. Alarms from both systems are located on the control panel and the observation site. Also linked to each pump is a hand switch (HS-100), located on the control panel for manually turning each pump on or off. Prior to each system's (A and B) centrifugal pump is a check valve followed by a ball valve. Following each pump is a pressure indicator (PI), sampling port and a ball valve.

Operational Description - Each pump draws water from the recirculation/accumulation tank. The pump provides the force needed for the jet pumps to function and the force necessary to convey extracted water to the recirculation/accumulation tank.

Conveyance From Tank to the Air Stripper

Purpose - To provide a flow of affected ground water from the recirculation/ accumulation tank to the low-profile air stripper.

Equipment Description - The piping is Schedule 80 four (4) inch PVC. A control valve is located immediately prior to the air stripper, this valve is spring loaded to close and halt water flow from the tank in the event of a total power failure.

Operational Description - The pipe provides a gravitational flow of affected ground water from the recirculation/accumulation tank to the low-profile air stripper.

Air Stripper

Purpose - To aerate the ground water to promote the volatilization of volatile organic compounds (VOCs) and the subsequent removal.

Equipment Description - The air stripper is a Shallow Tray 31231 three tray air stripper. The air stripper is an 8'3" high rectangular tower with an overall width of 5'10" and an overall length of 12'6". This system can accommodate flows in the range of 1 to 270 gpm. The tower is constructed of 304L stainless steel.

Other equipment accompanying the air stripper include a centrifugal blower, effluent holding tank, three separate trays, an inlet screen and damper, steel demister, air pressure gauge, sight tube, and Schedule 80 PVC piping. The blower is a 10 Hp blower capable of delivering up to 1800 cfm of atmospheric air to the tower. The effluent holding tank has a capacity of 270 gallons.

The centrifugal blower is located outside on the lower half of the stripper. The atmospheric air flow is controlled by an inlet plate on the side of the pump. **This plate should never be operated more than half way open.**

The level in the effluent holding tank is monitored by a level switch (LSH-100) which is connected by a data link to the PLC. When the effluent level in the tank rises to the preset high mark, alarms (LAH-400A&B) will activate. Alarms are located on the main control panel and at the remote observation site (GWS).

The air flow from the blower is also monitored to detect low flow. If such a situation occurs the flow switch low (FSL-500) is activated. This is then fed to the PLC, which in turn, activates alarms FAL-500 at the main control panel and the remote observation site (GWS). The system shuts down automatically upon a deviation from normal operating conditions.

Operational Description - The recirculation/accumulation tank receives affected ground water. When the tank fills to the preset outlet level, the affected ground water

overflows from the tank to the air stripper by gravitational flow. The affected ground water then flows across the upper distribution tray of the air stripper, where it is uniformly distributed over a pattern of 3/16-inch diameter holes through which a continuous stream of air is passed. The extracted ground water then drains by gravity through two additional trays to a sump located at the bottom of the air stripper. As the extracted ground water passes downward through these trays, an air stream is continuously forced upward through the ground water by the air blower.

Upon exiting the third and final tray, the treated ground water enters an effluent holding tank. The level of the water in the holding tank is maintained by an inverted "U" trap, which prevents air from exiting the air stripper with the treated water.

After passing through the tower, the exiting gas stream flows through a demister to remove any entrained moisture present in the gas. The gas exits the air stripper at the top through a 6" PVC stack. The 6" PVC stack will exhaust directly to the atmosphere through the roof the of treatment system shelter.

Theory of Operation - Air stripping is a physical process in which VOCs are forced into equilibrium between water and air phases. The three tray, low-profile air stripping system uses forced air in combination with the chemical properties of the VOCs to efficiently remove the VOCs from the ground water. The ability of a VOC to be air stripped is measured by its tendencies to volatilize from water. The baffles within the tower enhance the air stripping process by providing a surface for highly effective air - water contact.

This counter-current flow of extracted ground water and air induces mass transfer of VOCs from the ground water and into the air stream. The VOCs are stripped from the water phase and introduced to the air phase. Treated ground water will flow by gravity from the low-profile air stripper through a flow-measuring flume and on into the discharge diffuser at the NPDES outfall to Jones Creek (OSN 001). The flow is continuously monitored and recorded by the flow recording device (FQI-500).

Conveyance From Air Stripper to Diffuser

Purpose - To convey water from the effluent tank in the air stripper to the diffuser.

Equipment Description - The piping initiates with six (6) inch Schedule 80 PVC. The middle section of the pipe is a six (6) inch flexible corrugated high density polyethylene pipe. Prior to entering the diffuser the pipe is six (6) inch Schedule 80 PVC pipe.

Along the pipe is a flow indicating transmitter (FIT-500) which is linked to the PLC. The PLC and FIT-500 operate a flow quantity indicator (FQI-500A&B), a flow quantity recorder (FQI-500) within the PLC, and a high flow alarm (FAH-500A&B) at the main control panel and at the remote observation site. A relief valve is located prior to the sampling port. A ball valve is located immediately before the drain.

Operational Description - The piping serves to provide a gravitational flow from the effluent tank on the air stripper to the diffuser located at the NPDES permitted outfall in Jones Creek.

Diffuser

Purpose - To disperse the water evenly into Jones Creek to prevent erosion and minimize point source effects from the treated effluent to the native fauna and flora of the creek.

Equipment Description - The diffuser is a 10-foot Schedule 80 four-inch PVC pipe. The pipe is perforated with 10 one-half (1/2)-inch diameter holes evenly distributed along the length of the pipe. Both sides of the pipe are seated in concrete and the diffuser vessel (pipe) itself is on a rip rap base to prevent shifting.

Operational Description - Treated ground water enters the diffuser and exits to the creek from the one-half (1/2)-inch diameter holes across its length.

2.1.2 System Start-Up for Low Profile Air Stripper and Ground Water Well Systems

1. The level of the tank must be at the invert of the discharge pipe.

2. Using HS-500 on the control panel turn the blower (blower B500) on.

   a. Each time startup is performed check and make sure the blower is turning in the direction indicated on the blower casing.

   b. Upon initial startup, follow the sequence of steps below:

      1) Turn off electrical components and close drain and sample valves. Check that all electrical components associated with the unit are turned off, and all drain and sample valves are closed. (Note: Be sure that the sight tube valve is open).
      2) On initial start-up, the sump tank must be filled with clean water to a height of one foot. Make sure the valve to the sight tube is open. The sump tank can be filled via clean-out ports, located on the left side of the unit, or through the inlet piping.
      3) Fill the inlet chambers with clean water. To fill the inlet chambers (this is not necessary for a one-tray system), start the air blower and the water flow to the unit. Let both run for about two minutes, then shut them off. When the wheel to the blower stops spinning, restart both the blower and the water flow. This procedure allows the water to drip into the seal pots. If the seal pots won't fill by this method, they can be filled manually. First try spraying a stream of water through the clean-out ports, on the left side of the unit. The stream of water must be sprayed straight across the system and hit the opposite side. The splashing action should fill the seal pots. If the preceding methods don't work, remove the trays, fill the seal pots, and re-assemble. New units provide inlet chamber filling ports.
      (4) Turn 'ON' the master power disconnect switch on the power disconnect panel.
      (5) Check the blower rotation. Check the blower rotation by momentarily switching on the blower switch and observing whether the blades turn in the direction of the arrow on the blower casing.
      (6) If blower rotation is correct, fully open the air inlet damper and turn the blower switch to 'ON." Otherwise check wiring per manufacturer's instructions and correct if necessary. This step should be performed by a qualified electrician.
      (7) Start the clean water flow to the unit. Let the clean water and blower run for two minutes then shut both off. Once the blower wheel stops rotating, restart both the blower and the feed water flow. This procedure should fill the inlet chambers as described below.
      (8) Fill the inlet chambers with clean water.
      (9) Connect contaminated feed water line. Replace clean water feed line with contaminated feed line.
      (10) Check the air pressure readings. After the unit has been operating five to ten minutes, the air pressure readings should be approximately 11 inches (pressure readings may vary slightly) of water column.
      (11) The system is now ready for operation. It is not necessary to perform initial start-up procedures each time the system is shut down. The system will already be primed from the last run.

3. Start up each Systems A and B separately.

4. Manually close the ball valves in each well's valve vault (System A has seven wells and System B has four wells).

5. Manually open the ball valve between the tank and the centrifugal pump.

6. Manually open the ball valve immediately following the centrifugal pump.

7. Open the ball valve on the return pipe at the pump pad.

8. Using the hand switch on the control panel (HS-100 for system A and HS-200 for system B turn the centrifugal pump on. Follow the steps below for turning the pump on.
   a. Lock out power to motor.
   b. Make sure coupling hubs are securely fastened to shafts.
   c. Check impeller clearance (factory set at .015 in.); this could change based upon the piping attachment.
   d. Unlock motor power.
   e. Jog motor long enough to determine direction of rotation. It must correspond to the direction indicated by the arrow on the bearing housing.
   f. Lock out power to motor.
   g. Make sure suction valve and any recirculation or cooling lines are open.
   h. Fully close or partially open discharge valve as indicated by system conditions.
   i. Unlock motor power.
   j. Start driver.

9. Check flow meters on each well.

10. Proceed to manually open the ball valves within each wells valve vault.

11. Close the valve at the turnaround valve pit.

12. Check the pressure gauges for each well.
   a. The pressure of the jet pump should be 180 psi.
   b. The pressure gauge in the vault should indicate less than 180 psi.

13. Check the water level in each well with a probe.

14. Modulate the valve at the turnaround valve pit to adjust flow rates for the overall system.

15. Adjust ball valve on the return line for each individual well to maintain the specified water level in that well.

16. Repeat steps four (4) through fourteen (14) for the second system (A or B).

GROUND WATER SYSTEM START-UP

STEP #	PROCESS	INITIALS
1	The level of the tank must be at the invert of the discharge pipe.	
2	Using HS-500 on the control panel turn the blower (blower B500) on. a. Check blower rotation. b. For initial system startup, refer to page 2-8 of O&M manual.	
3	Start up each System A and B separately.	
4	Manually close the ball valves in each well's valve vault (System A has seven wells and System B has four wells).	
5	Manually open the ball valve between the tank and the centrifugal pump.	
6	Manually open the ball valve immediately following the centrifugal pump.	
7	Open the ball valve on the return pipe at the pump pad.	
8	Using the hand switch on the control panel (HS-100 for system A and HS-200 for system B turn the centrifugal pump on. Follow the steps below for turning the pump on.	
9	Check flow meters on each well.	
10	Proceed to manually open the ball valves within each well's valve vault.	
11	Close the valve at the turnaround valve pit.	
12	Check the pressure gauges for each well. a. The pressure of the jet pump should be 180 psi. b. The pressure gauge in the vault should indicate less than 180 psi.	
13	Check the water level in each well with a probe.	
14	Modulate the valve at the turnaround valve pit to adjust flow rates for the overall system.	
15	Adjust ball valve on the return line for each individual well to maintain the specified water level in that well.	

2.1.3 Normal Operation

The ground water remediation system is virtually self automated once the system is running. However, it is necessary to run daily and periodic checks on the jet pump extraction and treatment system to monitor integrity of the systems. Operation of the systems can be monitored from off-site by a computer and modem hook-up at RMT's Greenville office.

Pump operating motor alarm lights at the main control panel indicate that Pump A or B is running.

A series of tables located in Section 5.4 provide a list of necessary daily and weekly monitoring. Monitoring includes flow, pressure at pressure gauges, and physical conditions of the piping and equipment to maintain the flawless working condition of the system.

2.1.4 Normal Shutdown

Normal shutdown of the ground water remediation system is performed by the following sequence of steps.

1) Turn off both centrifugal pumps with the hand switches on the control panel. HS-100 operates system A and HS-200 operates system B for the centrifugal pumps.
2) Check the pressure indicators for each well. When all wells have no pressure proceed to step #3.
3) Check the flow quantity indicator for the outlet piping from the air stripper located on the control panel as FQI-500A. When this indicates zero (0) flow, turn the blower to the air stripper off. The blower may be turned off by HS-500 at the control panel.

2.1.5 Emergency Shutdown

Emergency shutdown can occur under several different conditions. When the level alarm high high (LAHH) in the recirculation/accumulation tank is activated both centrifugal pumps are automatically shutdown and the control valve between the air stripper and the accumulation/ recirculation tank is closed. The blower to the air stripper is shutdown after a delay period, in order to clear out any water already in the air stripper.

In the case of a low level in the tank, only foreseeable through vandalism or a leak in the tank, the level alarm low (LAL) would be activated. Both the centrifugal pump and the blower for the air stripper would be sequentially shutdown automatically. A malfunction of the blower includes

any incidence that prohibits the necessary volumetric flow of atmospheric air to the air stripper trays. Situations that may cause this would be a power outage, a short in the system, or the sliding door that controls the atmospheric air flow to the blower has been closed too far. If this occurs, both centrifugal pumps are automatically shutdown and the control valve to the air stripper is closed, preventing the flow of additional water.

2.1.6 Troubleshooting and Alternate Operation

The system is capable of shutdown and ceasing of discharge to the outfall at Jones Creek in the event of a system malfunction. The risk associated with inadvertent discharge of untreated ground water with this situation is minimal. The system will automatically shut down in the event of any of the potential problems listed below.

- The level in the recirculation/accumulation tank reaches either the high high or low level,
- A motor malfunction to either centrifugal pump,
- A high level in the sump tank of the air stripper,
- Flow out of the blower to the stripper is low,
- A motor failure at the blower,
- High flow level out of the air stripper, or
- Power failure.

Each of these situations causes a control valve to shut down flow from the tank and cease discharge to Jones Creek. For troubleshooting tips associated with the pump see Appendix K (Table 7, Troubleshooting Pump). For other troubleshooting tips see the table below.

TROUBLESHOOTING & ALTERNATE O & M - GW

PROBLEM	PROBABLE CAUSE	REMEDY
Low Level in tank	Leak in the tank	Contact Project Manager [(803) 281-0030]
High High level in tank	System clogging down stream	1) Check the control valve; if it is not open check air stripper, 2) If stripper OK then open control valve 3) Check air stripper for clogging & clean if necessary.
Inadequate pumping	Refer to table #7 for pump	Refer to Table #7 for pump or phone vendor at (404) 446-3369
Flow in or out of well is out of spec.	Ball valves on inlet or outlet area not correctly set.	Adjust the ball valves to obtain correct readings.
Pressure is out of specification on inlet piping of a well	Ball valves on inlet or outlet area not open or closed appropriately.	Adjust the ball valves to obtain correct readings.
Pressure after the centrifugal pump is too high or low	Ball valve on inlet to the pump is not correctly set	Adjust the ball valves to obtain correct readings.
High level in air stripper sump tank	Outlet valve is closed	Open outlet valve.
Problem with the air stripper	Refer to air stripper material in Appendix G	Refer to air stripper material in Appendix G.
System won't start	Power failure	Check main power feed panel and/or power fee.

2.2 Soil Remediation System Description

2.2.1 System Description and Equipment

Vapor Extraction Wells

Purpose. To extract volatile and semivolatile organic compounds from vadose zone soils (soils located above the saturated water table).

Description. The two-inch Schedule 40 PVC extraction wells will be screened approximately ten feet above the mean high water elevation to the surface. Each well will be 30 feet in length and will have 0.020-inch continuous slotting. Prior to the vapor from each well entering the pump, the vapor passes through a ball valve and condensate trap, after the central header. The vacuum piping will be embedded in a shallow trench. In areas of known vehicular traffic the vacuum piping will be encased in steel piping.

Condensate Trap

Purpose. Remove entrained water vapor from the air stream before it passes through the vacuum pump.

Description. The condensate trap is a 50½-inch long, 16-inch diameter cylinder Model VI-5 with a universal separator silencer. Water vapor removal efficiency is rated at 95 percent at a maximum capacity of 40 GPM. The condensate trap is equipped with two sight gauge holes, one near the bottom of the cylinder and the second near the half-way point. At the top of the cylinder is a one-half-inch water pump vent to allow for the venting when removing accumulated water from the water outlet at the base of the cylinder.

Operational Description. Upon passing through the central header, vapors enter the condensate trap. Vapors pass through the length of the condensate trap where entrained water vapor is removed continuously. The vapor enters on the upper half along the side of the trap and is discharged at the top. The inlet and outlet openings are five-inch diameter connections. The level of the water within the glass is monitored. In the event that the level rises to the preset maximum high, a level switch high (LSH 1100) shuts the vacuum pump off. The water in the stripper may be removed manually, by opening the ball valve and draining the water. All condensate water removed from the system will be discharged to the accumulation/recirculation tank of the ground water treatment system.

Particulate Filter

Purpose. To remove fine particulate matter from the air stream prior to entering the pump.

Description. The particulate filter is an Inline Model F65-5 capable of handling volumes of air up to 750 cfm. The filter removes particles of 10 µm and larger with a 98 percent rated efficiency. The housing of the filter is designed to withstand 15 psig. The pressure drop of the system at rated flow is approximately two (2) inches of water (0.15 inches Hg).

Operational Description. The extracted vapor flows through the condensate trap, then enters a Schedule 40 PVC pipe, and passes to the fine particulate filter. The pressure drop of the air across the filter is monitored by a differential pressure gauge. If the pressure drop exceeds the preset maximum, then the differential pressure switch high (DPSH 1200) is activated. The activation of this switch shuts down the system's vacuum pump. Upon exiting the filter, both pressure and flow are measured by a pressure indicator (PI-1201) and a flow indicator (FI-120).

Air Intake

Purpose. To provide make-up air to the system when necessary to start the vacuum pump. The air intake will also be used to control the air flow on the intake and thereby regulate the vacuum pressure applied to each well.

Description. The air intake is equipped with a pleated skirt intake filter. Air flow through the system is controlled by a globe valve and has a maximum flow rating of 750 cfm.

Operational Description. The air intake brings air from the atmosphere, passes it through a filter and a globe valve, and flows into the central piping for the SVE system.

A flow meter and pressure gage serve as an indicator for regulating the make-up air provided by the air intake. The globe valve serves to regulate the air flow and pressure. By manipulating the globe valve the pressure exerted on the extraction wells is controlled.

Inlet/Discharge Silencer

Purpose. To reduce the noise levels created by the vacuum pumps.

Description. The Universal SD4 Model 6 is constructed of carbon steel. The 64-inch long, 14-inch diameter silencer is encased in a welded structure to prevent manipulation with the internal components.

Operational Description. The extracted air flow enters from the lower side of the cylinder and exist from the top. The attenuation curve is found in the specification data sheet for the silencers. The inlet silencer is directly upstream from the vacuum pump. The discharge silencer is directly downstream from the vacuum pump.

Vacuum Relief Valve

Purpose. To provide an air inflow to the vacuum pump preventing the collapse of piping between vacuum pumps and the air intake.

Description. The vacuum relief valve is a Kunkle model 215V size 3 spring type valve with cast iron and bronze trim.

Operational Description. In the incidence the system was plugged to the extent the vacuum was not receiving sufficient air, the spring valve would open allowing atmospheric air to flow directly into the system.

Vacuum Pump

Purpose. To provide the suction required to extract vapors laden with hydrocarbons entrained in the soils from the extraction wells.

Description. A Roots Model 59 rotary eight lobe positive displacement pump serves as the vacuum pump for the SVE system. The pump is capable of producing 500 SCFM under no load and capable of operating up to a vacuum of 190 inches of water (14 inches Hg). The inner components and housing dimension and description may be found in Appendix E in the equipment cut sheet.

2.2.2 System Start-Up

To activate the soil vapor extraction system, follow these steps.

1) For initial start up, check to make sure the rust inhibitor has been removed from the vacuum pump.

2) Open the globe valve on the air intake.

3) Start the vacuum pump by the hand switch (HS-1300) on the control panel.

4) Open the ball valve to each well that is intended for use.

5) Modulate the opening of the globe valve on the air intake to achieve the proper pressures for the system (found in Appendix L), System Air Pressures for Operation.

   NOTE: The pump may only be turned on if the control clock (KS-1300) located on the control panel is set on. It is anticipated that this system would only be operated during daylight hours.

2.2.3 Normal Operation

The SVE remediation system is virtually self automated. However, it is necessary to run daily and periodic checks on the system. Remote monitoring of the system's operation may be performed using a computer and modem hook-up located at RMT's Greenville office.

A series of tables in Section 5.4 provide a list of necessary daily checks for the SVE system. The checks include temperature and pressure readings at the gauges, conditions of the piping and equipment, and integrity of the vacuum wells and site security.

2.2.4 Normal Shutdown

Normal shutdown of the SVE system is performed by the following steps.

1) Turn the hand switch (HS-1300) located on the control panel for the vacuum pump to the off position.

2) Close the globe valve on the air intake.

2.2.5 Emergency Shutdown

Emergency shutdown can occur in several instances under various conditions. The vacuum pump is the only piece of equipment turned off during an emergency shut down.

SVE SYSTEM START-UP

STEP #	PROCESS	INITIALS
1	For initial start up, check to make sure the rust inhibitor has been removed from the vacuum pump.	
2	Open the globe valve on the air intake.	
3	Start the vacuum pump by the hand switch (HS-1300) on the control panel.	
4	Open the ball valve to each well that is intended for use.	
5	Modulate the opening of the globe valve on the air intake to achieve the proper pressures for the system (found in Appendix L), System Air Pressures for Operation.	

NOTE: The pump may only be turned on if the control clock (KS-1300) located on the control panel is set on. It is anticipated that this system would only be operated during daylight hours.

The pump is automatically shut down in the event of one of the following situations:

- The level of the water in the condensate trap exceeds the preset height and actuates level switch high (LSH-1300),
- The pressure drop across the air filter exceeds the preset maximum allowable drop. The differential pressure switch high is actuated when this maximum drop occurs,
- A motor failure of the centrifugal pump, and
- The temperature of the vapor downstream of the pump exceeds the preset maximum, which actuates the temperature switch high (TSH-1300) to shut down the pump.

2.2.6 Troubleshooting and Alternate Operation

The automation of the system is designed to handle any problem that may arise. A list of events that could potentially cause a system shutdown are listed below.

- High water level in the condensate trap,
- High differential pressure across the inline filter,
- High temperature of extracted vapor downstream from the vacuum pump,
- Motor failure to the vacuum pump, or
- Power failure.

Each of these situations alone will cause a system shutdown. The risk associated with any or all of the mechanical or electrical failure is minimal, due to the nature of the system.

TROUBLESHOOTING AND ALTERNATE OPERATION - SVE

PROBLEM	PROBABLE CAUSE	REMEDY
Level High in condensate trap	Too much water within trap	Open ball valve and remove water
High differential pressure across in-line filter	Damaged or clogged filter screen	Locate faulty screen and replace
Low pressure to extraction wells	Globe valve to air intake open too much	Close globe valve on air intake to obtain correct pressure on system.
High pressure to extraction wells	Globe valve to air intake closed too much	Open globe valve on air intake to obtain correct pressure on system.
Motor failure to vacuum pump	Defect or malfunction in motor	Contact RMT's Project Manager at (803) 281-0030 OR Brown & Morrison at (704) 554-8570
High temperature down stream from vacuum pump	Vacuum malfunction	Contact RMT's Project Manager at (803) 281-0030
System Shutdown	High water level in condensate trap	Open ball valve: remove the water
	High differential pressure across in-line filter	Locate & replace damaged or clogged filter.
	High temperature downstream from pump	Check for obstructions by listening; contact RMT's Project Manager at (803) 281-0030.
	Motor failure for pump	Contact RMT's Project Manager at (803) 281-0030

2.3 Miscellaneous System Descriptions

Modem Communication System (System Alarms)

The system features three critical alarms, which occur at the time of an automated system shutdown. The first of these alarms occurs when the flow alarm low (FAL-500) is activated during low air flow from the blower. FAL-500A on the control panel will activate as well as FAL-500B for the PLC.

The other two critical alarms occur with a failure one of the centrifugal pumps. Motor alarms for Systems A and B occur in the event of a pump failure. MA-100A and B occur for System A and MA-200A and B occur for System B.

All three critical alarm B's (FAL-500B, MA-100B, MA-200B) are operational within the PLC. Any of these alarms will activate a modem which will phone a preselected number at the GWS until it receives an answer. The equivalent alarm trips on site (FAL-500A, MA-100A, MA-200A).

Manhole System

Three system manholes are located at the site. Each manhole is numbered (1-3) for easy identification. The entry to each manhole will be locked to prevent unauthorized entry. The location and description of the system manholes are summarized below:

Manhole #	Location	Description
1	At flow recorder after the air stripper	Fiberglass manhole for metering flow out of system
2	At the change in grade of discharge pipe	Standard manhole
3	At the energy dissipator (diffuser)	Standard manhole for sampling

The manholes are located between the air stripper and the creek. Starting with #1 at the flow recorder and proceeding to #3 at the creek discharge

Alarms Schedule

Alarm Code	Description	Location
LAL-100A	Low level alarm for tank	Control panel
LAL-100B	Low level alarm for tank	Observation site
LAHH-100A	High high level alarm for tank	Control panel
LAHH-100B	High high level alarm for tank	Observation site
MA-100A	Motor alarm for system A	Control panel
MA-100B	Motor alarm for system A	Observation site
MA-200A	Motor alarm for system B	Control panel
MA-200B	Motor alarm for system B	Observation site
LAH-400A	High level alarm for air stripper tank	Control panel
LAH-400B	High level alarm for air stripper tank	Observation site
FAL-500A	Low air flow alarm for blower on stripper	Control panel
FAL-500B	Low air flow alarm for blower on stripper	Observation site
MA-500A	Motor alarm for blower motor	Control panel
MA-500B	Motor alarm for blower motor	Observation site
FAH-500	Flow alarm high for outlet pipe from stripper	Control panel

Section 3
MAINTENANCE OF SYSTEMS

3.1 Ground Water Remediation System Maintenance Tasks

3.1.1 Mechanical Equipment

Pump

The centrifugal pumps for systems A & B are subject to the following maintenance records.

Initial Start-up

1. Add oil to bearings up to the center of the sight glass.
2. Pack the stuffing box.
3. Check impeller clearances and reset if necessary.

First 200 hours

1. Change oil.

3 Month or 3000 hours

1. Check foundation and hold down bolts for tightness
2. If pump has been left idle, check packing. Replace if necessary.
3. Change oil.
4. Regrease bearings.

Annually

1. Check pump capacity, pressure, and power feed. If pump performances have changed dramatically, pump should be disassembled, inspected, and worn parts should be replaced, otherwise a system inspection should then be performed.

For in-depth description of each process refer to the handbook in Appendix F and see the following Pump Maintenance Table for record keeping.

PUMP MAINTENANCE TABLE

START-UP	INITIALS	DATE
Add oil to bearings		
Pack the stuffing box		
Check impeller clearances		
FIRST 200 HOURS		
Change oil		
3 MONTHS OR 3000 HOURS		
Change oil		
Check packing if pump has been idle		
Regrease bearings		
Check foundation & hold down bolts for tightness		
6 MONTHS OR 6000 HOURS		
Change oil		
Check packing if pump hs been idle		
Regrease bearings		
Check foundation & hold down bolts for tightness		
9 MONTHS OR 9000 HOURS		
Change oil		
Check packing if pump hs been idle		
Regrease bearings		
Check foundation & hold down bolts for tightness		
12 MONTHS OR 12000 HOURS		
Change oil		
Check packing if pump has been idle		
Regrease bearings		
Check foundation & hold down bolts for tightness		
Check pump capacity, pressure & power against specifications		

Repeat this schedule for every [3 month or 3000 hrs]
NOTE: Initial each task following its completion.

Air Stripper

The air stripper is subject to fouling from high dissolved minerals concentrations. This fouling can potentially clog aeration levels and the demister pad. To remove these mineral deposits, spray both sides of all three trays with a pressure washer. Starting from the lower most tray, clean from bottom to top; repeat on tray two and then tray one. Remove the sedimentation and water with a wet dry vacuum. These procedures are expanded upon in the maintenance section of the air stripper handbook found in Appendix G.

3.1.2 Instrumentation and Controls

Annual calibration of transmitters.

3.2 Soil Vapor Extraction System

3.2.1 Mechanical Equipment

Condensate Trap - Check the water level in the trap by the sight glass daily. When the water is at the high level glass, open the vent and remove water into a bucket. Manually carry this water to the recirculation/accumulation tank for treatment in the ground water remediation system. Pour the water into the 18" manway provided for access to the recirculation/ accumulation tank. (You will need to use the ladder provided).

In-line Filter - The interior filter will have to be replaced at an interval to be established once startup has begun, based on operating conditions.

Vacuum Pump - The vacuum pump for the SVE system is subject to the following maintenance record.

Initial Startup

1) Add oil to reservoir to the full mark.

Every 1000 Hours

1) Change oil.

3.2.2 Instrumentation and Controls

Annual calibration of transmitters.

3.3 Schedule of Activities

[This section is being developed based on vendor data].

Section 4
HEALTH AND SAFETY

4.1 Health and Safety Plan

RMT developed a Health and Safety Plan for the Medley Farm Site that was submitted to the US EPA and SC DHEC in March 1992. Specific changes were recommended by US EPA and incorporated in April 1992. By reference, this Operations and Maintenance manual incorporates the RMT Health and Safety Plan in its entirety. A copy of the Health and Safety Plan is readily accessible on site and is located at the ground water treatment facility.

The following sections summarize the most important standard operating safety procedures and controls, the emergency safety procedures and equipment, training requirements, medical surveillance, and recordkeeping.

4.2 Standard Operating Safety Procedures and Controls

Some of the major standard operating safety procedures and controls are listed below. The reader should refer to Sections 6 through 11 of the latest revision of RMT's Health and Safety Plan.

Environmental Monitoring

- For surface/intrusive work associated with various wells, borings, and other activities such as earthwork and grading, trenching, and underground pipe laying, organic vapor readings will be made using either a Foxboro OVA (Model 128), an HNu Photoionization Analyzer (Model PF101), or a Photovac Microtip.

- A periodic (weekly, monthly) monitoring of equipment seals, fitting, and well heads should be made to determine if system leaks are occurring. The monitoring should be performed visually and with either a Foxboro OVA (Model 128), an HNu Photoionization Analyzer (Model PF101), or a Photovac Microtip.

Personal Protective Equipment

- Personal protective equipment (PPE) to be worn on site during operation include hard hat, safety glasses, work boots, and work gloves.

- During sampling activities of soils or ground and surface waters, additional PPE may include neoprene, nitrile or heavy duty PVC boots, Tyvek suits, nitrile or neoprene gloves, and as necessary (if monitoring indicates a need) a full face respirator with organic vapor cartridges and hearing protection.

- Respiratory protection requirements during normal operations should not be required.

- Site security shall be maintained to prevent potential vandalism and accidents by others. The equipment that is not in operation shall be locked out to help prevent operation by unfamiliar operators or others. The fencing and gates should be visually inspected for damage or vandalism that may affect the integrity of the remediation system.

Personal Precautions

- Be familiar with standard operating safety procedures and adhere to all instructions and requirements in the site Health and Safety Plan.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any contaminated or potentially contaminated area.

- Contact lenses shall not be worn in any contaminated area or in any area where safety glasses or respiratory protection are required.

- Hands and face must be thoroughly washed upon leaving the work area. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

- No facial hair which interferes with a satisfactory respirator fit of the mask-to-face-seal is allowed on personnel required to wear respirators.

- Avoid contact with contaminated or suspected contaminated surfaces. Whenever possible, avoid wading through puddles, pools, mud, etc. Avoid kneeling or sitting on the ground, equipment or drums.

- Personal articles shall be prohibited in any contaminated area.

- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Alcoholic beverage intake should be minimized or avoided on off work hours during field operations. Prescribed drugs should not be taken by personnel on site operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Do not work when ill.

- Identify potential health and safety hazards and contact the appropriate person to initiate corrective action.

Operational Requirements

- Personnel going on-site shall be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures, and communications. For site workers who are reasonably expected to

encounter exposure hazards, this training entails 40 hour health and safety training along with up-to-date refresher training. This training is not required for workers not expected to encounter potential exposure hazards, such as electricians who will not perform subsurface work.

- Respiratory protective devices and/or protective clothing appropriate to the designated levels of protection shall be worn by all personnel going into areas designated for wearing protective equipment. A protection level of D is expected around the pump pads during normal operation. More stringent levels of protection may be required if conditions so warrant (i.e. high VOC air concentrations).

- During continual operations, on-site workers shall act as safety backup to each other. Off-site personnel shall provide emergency assistance.

- Personnel should practice unfamiliar operations prior to doing the actual procedure.

- Entrance and exit locations shall be designated and emergency escape routes delineated. The following warning signals shall be used when necessary:

  Hand gripping throat . . . . . Can't breathe
  Grip partner's wrist or
  both hands at waist . . . . . Leave area immediately
  Hands on top of head . . . . . Need assistance
  Thumbs up . . . . . Ok, I am all right, I understand
  Thumbs down . . . . . No, negative

- Communications shall be maintained between field team members at all times. A permanent telephone will be located at the ground water treatment facility to facilitate emergency response communications.

- Decontamination procedures for leaving a contaminated area shall be followed. Hands and face shall be washed prior to work breaks and eating. Work areas and decontamination procedures have been established based on expected site conditioned (see Section 11 of RMT's Health and Safety Plan).

4.3 System Failure Activities

Preventing accidents is the responsibility of each individual on site. Unsafe or dangerous working conditions shall be reported immediately to the site Health and Safety Representative and the Project Manager. The project Health and Safety Representative and Project Manager will be responsible for seeing that the Health and Safety Program is properly implemented.

All Contractors and Subcontractors shall be responsible for instructing their workers in safe work practices and emergency procedures. This is an important duty and responsibility for each of the

contractor(s) and subcontractor(s). RMT's Health and Safety Plan will be made available to all contractor(s) and subcontractor(s) for their review and information. Each contractor and subcontractor is responsible for developing and implementing their own site Health and Safety Plan.

The system operator(s) shall be familiar with the RMT Health and Safety Plan and its contents. Section 4 of the RMT Health and Safety Plan describes the hazard assessment of the chemical constituents that could potentially be encountered. Section 13 of the Health and Safety Plan describes Emergency Procedures and lists phone numbers.

4.3.1 Medical Emergencies

For physical injuries, first aid treatment shall be given at the site, depending upon the seriousness of the injury. The victim should undergo decontamination, if necessary, unless such procedures interfere with necessary treatment. In life-threatening situations care shall be instituted immediately. Always remove respirators. Protective clothing shall be removed or cut away if this will not cause delays, interfere with treatment, or aggravate the problem. If contaminated protective clothing cannot be removed, wrap the victim in clean materials to help prevent contamination of medical personnel and ambulances.

For chemical exposure emergencies, decontamination procedures shall be followed unless severe medical problems requiring life sustaining measures are evident. Chemical exposures are unlikely during normal system operations, and are more associated with intrusive investigations at this site.

Emergency equipment available on-site shall include:

- First Aid Kits, (16 unit as specified in National Safety Council Data Sheet No. 202 or equivalent),
- Portable Eyewash (15 minute duration)
- Full Face Respirators - HEPA/Organic Vapor Combination Cartridges (GMA-H or GMC-H),
- Portable telephone,
- Fire Extinguisher.

In the event of injury, the emergency shall be handled according to the procedures described in the Emergency Procedures (Section 13 of the Health and Safety Manual). The first aid kits shall be maintained at the control access point to the operation and in support vehicles.

If the victim cannot be safely moved from the contamination area, first aid necessary to stabilize the victim for safe transport shall be administered at the accident location. Appropriate decontamination of all clothing and equipment shall be followed if necessary.

4.3.2 General Emergency Procedures

- In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on the scene, the entire field crew shall immediately halt work and act according to the instructions provided by the HSR.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated, shall result in the evacuation of the field team and re-evaluation of the hazard and the level of protection required.
- In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on the site, the entire field crew shall immediately halt work and act according to the instructions provided by the site HSR. Follow-up action shall be taken to correct the situation that caused the accident. The HSR then shall complete an Accident Report.
- Solid materials that are spilled will be scooped up, placed in appropriate containers and held for disposal. Spilled liquids will be neutralized or containerized and held for disposal. Prior to spill clean up, the Health and Safety Coordinator will be consulted to confirm that employees are protected during that work.

4.3.3 Personal Injury

Site personnel will be trained in American Red Cross first aid procedures and shall administer appropriate first aid treatment, including CPR, in emergency situations. The following general emergency procedures shall be carried in the event of injury:

(1) Notify the HSR of the incident.

(2) If the victim can be moved safely, remove him/her from the contaminated zone to the decontamination zone using established control points.

(3) Administer first aid.

(4) Transport victim to nearest hospital or emergency medical center or call for ambulance transport, as appropriate.

NOTE: The HSR shall direct the removal of injured personnel from the contaminated zone and shall approve any necessary deviation from established decontamination procedures. Such deviation shall be based upon the severity or life threatening nature of the injury.

(5) Notify the HSC of the incident and describe the emergency response actions taken. A follow-up written report will be provided to the HSC and the Project Manager.

4.3.4 Chemical Exposure

Before entering a contaminated zone, all site personnel shall be thoroughly acquainted with the types of toxic/hazardous chemicals present on site and their potential concentrations. The following general procedures shall be followed for chemical exposure emergencies:

(1) Move the victim from the immediate area of exposure/contamination, taking precautions to prevent additional exposure of other individuals.

(2) Notify the HSR of the exposure incident.

(3) If the victim can be moved safely, proceed to the decontamination zone through established control points.

(4) Decontaminate clothing or remove clothing if safe to do so.

- For skin or eye contact, thoroughly wash affected areas with water (eyes should be flushed for at least 15 minutes).
- For inhalation exposure, ensure that victim has adequate fresh air.

(5) Administer additional first aid treatment as appropriate.

(6) Transport victim to nearest hospital or emergency medical center or call for ambulance transport as appropriate.

NOTE: The site HSR shall direct the removal of injured personnel from the contaminated zone and shall approve any necessary deviation from established decontamination procedures. Such deviation shall be based upon the security or life threatening nature of the injury.

(7) Notify the HSD of the incident and describe the emergency response actions taken.

4.3.5 Fire or Explosion

In the event of a fire or explosion:

(1) Immediately evacuate injured personnel and leave the area,

(2) Administer first aid as appropriate,

(3) Notify emergency services,

(4) Notify the HSC.

4.3.6 Emergency Contacts

The appropriate contact(s) from the following list shall be made for all emergency situations.

Emergency Service	Telephone
Fire	911/487-2747
EMS	911/487-2747
Police	911/487-2747
Sheriff	911/487-2747
Highway Patrol	911/489-3116
Upstate Carolina Medical Center	487-4271 (Main) 487-1544 (ER)

NOTE: For ambulance, fire or police contacts, give the name of the road and the nearest intersection. The portable telephone on site will be used for emergency notifications. Upstate Carolina Medical Center is located at 1530 N. Limestone Street in Gaffney. Take a right from the site onto Burnt Gin Road (Hwy 72). Follow Highway 72 to Highway 18 and take a left. Follow Highway 18 into Gaffney.

After contacting emergency services, project contacts designated at the beginning of this Health and Safety Plan will be notified.

Section 5

ROUTINE MONITORING, RECORDKEEPING AND LABORATORY TESTING

The following section describes the routine monitoring, recordkeeping, and laboratory testing activities necessary to meet the requirements of US EPA's SOW under items 4 and 8 on pages 27 and 28. The activities will help to document and indicate whether the objectives of the ground water and soil remediation systems described in the RD are being met for the Medley Farm Site. The operator will normally be on-site once per day during the work week and can remotely check system conditions using a modem and computer.

5.1 Monitoring Activities and Schedule

5.1.1 Ground Water Remediation System

The routine monitoring activities to be performed on the ground water remediation system are summarized below.

Activity	Schedule	Who
Check liquid level in accumulation tank	Once per day and before each initial start up	Operator
Check direction of blower rotation	Before each start up	Operator
Check air pressure or air flow readings at blower for air stripper and inlet valve to centrifugal pump	5-10 minutes after start up and once per day	Operator
Check water flow rate through air stripper at flow recorder	Once per day	Operator
Perform grab sampling of treated discharge water (1,2-Dicholorethane, 1,1-Dichloroethene, Tetrachloroethene, Trichloroethene)	Once per week (1 - 2nd Monday every month)	Operator or Sampling Technician
BOD_5	Twice per month	Operator or Sampling Technician
Whole effluent toxicity testing	Once per month (1 - 2nd Monday)	Operator or Sampling Technician

5.1.2 Soil Vapor Extraction System

Check air filter for the SVE at air intake and prior to vacuum unit	Once per month	Operator

Check timer setting	Once per month	Operator
Damper opening on blower inlet air make-up	Once per day	Operator
Check flow in manhole between air stripper and diffuser	Once per day	Operator
Check outfall for no visible sheen or foam	Once per day	Operator or Sampling Technician
Check condition of parshall flume	Once per day	Operator
Check erosion, washout piping integrity	Once per day	Operator or Sampling Technician

5.2 Laboratory Testing

Sampling activities will be performed on the ground water treatment system between the air stripper and the NPDES 001 outfall in Jones Creek. The treated ground water discharge will be analyzed by a certified laboratory that conforms to the protocols contained int he March 1990 US EPA Contract Laboratory Program (CLP) Statements of Work for Organics. The samples will be analyzed for volatile and semivolatile analytes and BOD_5 as described in the draft NPDES permit (See Appendix M). Test procedures will also conform to regulations published pursuant to State Environmental Laboratory Certification Regulation 61-81 and Section 304(h) of the Clean Water Act (PL-92-500) as amended.

Results of the sampling analysis will be provided monthly to SC DHEC using Discharge Monitoring Report Forms (EPA Form 3320-1). The reports will be postmarked no later than the 28th day of the month following the month of sampling. Records will show the following information with regard to the sampling:

- the date, time, and place of sampling.
- the date and times of analyses performed,
- the laboratory certification number and person(s) performing the analyses
- the analytical techniques or methods used, and
- the results of the required analyses.

Records will be retained for a minimum of three (3) years, or longer if requested by SC DHEC. Records will be maintained on site for inspection by SC DHEC during normal business hours.

The operator or Project Manager shall report any non-compliance with the conditions or limitations of the draft NPDES permit which may endanger public health or the environment. The operator or Project Manager shall notify SC DHEC with 24 hours of becoming aware of such conditions. The phone number to call and notify SC DHEC are (803) 734-5300 during normal working hours and (803) 253-6488 during non-business hours at the 24 hour Emergency Response office. A written follow-up shall be made within five (5) days of becoming aware of such conditions. Refer to Part II.B.2 of the draft NPDES permit for specific non-compliance reporting tasks.

5.3 Personnel and Maintenance Records

Logs and reports sufficient to document the implementation and execution of the personnel protection programs shall be maintained. This documentation shall consist of medical surveillance files, training files, daily logs and accident reports.

5.3.1 Medical Surveillance

Confidential medical surveillance files are maintained by the Human Resources Manager. These files document employee participation in the medical surveillance program and fitness to work on hazardous sites. The Medical Clinic maintains medical records along with the Human Resources Manager. Access to these files and records is controlled by the HR Manager.

5.3.2 Training

Documentation of employee training is maintained in the Health and Safety files under the direction of the HSR. These files document employee attendance, level of training and follow-up; or refresher instruction.

5.3.3. Work Logs

Daily work logs shall be maintained by the HSR. Copies of daily logs shall be forwarded to the Project Manager or the HSC on request. The daily log shall contain:

- Date,
- Area(s) or site(s) worked,
- List of employees by area and hours exposed,
- Personal protective equipment utilized by employees,

- Results of monitoring tests,
- Waste materials removed from work area(s),
- List of equipment decontaminated, and
- Description of special or unusual events or incidents, including all first aid treatments not otherwise reportable.

Daily work logs shall be checked and approved by the HSR. Any incident resulting in a work stoppage shall be fully documented in a report prepared by the HSO and submitted to the HSC and the Project Manager.

5.3.4 Accident Reporting

In addition to descriptions in the daily log and work stoppage reports, any accident and/or chemical exposure incident shall be investigated, analyzed an documented in an accident investigation report submitted to the HSC and the Project Manager. These reports, prepared by the HSR in consultation with the HSC shall contain a full description and analysis of the incident, including exposure work-hours and a log of occupational injuries and illnesses (OSHA Form 200 or equivalent as prescribed by 29 CFR 19904).

Formal accident reports shall be prepared for any diagnosed illness or injuries that result in a lost work day or fatality. The accident report shall identify all contributing causes and recommend future hazard control measures to reduce the risk of recurrence.

Persons on site are responsible for reporting all injuries as soon as possible to the HSR or the HSC.

5.3.5 Maintenance Records

Records and logs will be maintained and based on actual system maintenance activities performed. Information to be recorded should include costs, downtime (if any), equipment type, date, personnel utilized for maintenance activities, cause for non-preventive maintenance and whether preventive measures or improvements could be made to resolve the cause, and system condition data prior to and following the maintenance work.

5.4 Systems Reporting

The following data sheets are to be used for systems monitoring and reporting for the ground water and soil vapor treatment systems.

VACUUM UNIT

OPERATIONAL READINESS CHECKLIST

POWER SUPPLY

Trace power lines and check that all connections have been made _____

Locate and verify that all circuit breakers are in off position _____

Locate grounding rod and verify that equipment is adequately grounded _____

Locate and tag the three wire leads to motor for motor rotation check _____

UNIT COMPONENTS

Verify that maintenance check has been performed and any outstanding items have been completed _____

Drain condensate trap of any liquids and close drain valve _____

Examine belts and sheaves for tightness and alignment _____

Check belts and sheaves for easeness of rotation _____

Check belt guard is in place and provides total enclosure _____

PIPING

Check all flange bolts for tightness _____

Check all gaskets for alignment and signs of fatigue (cracking, splitting, discoloration) _____

Verify that all suction and vent valves are fully open _____

Remove any loose objects from intakes _____

Check discharge piping and stack for obstructions _____

Temperature gauge reading _____

SAFETY

Ear protection Available _____

Vapor Monitoring Equipment Available _____

VACUUM UNIT PERFORMANCE

Table No. _____

Operator: _____ Date: _____

Time: _____

VAPOR FLOW RATES		**TEMPERATURES**	
Vacuum Manifold:	_____ CFM	Vacuum Manifold:	_____ CFM
Air Intake:	_____ CFM	Air Intake:	_____ CFM

VACUUM READINGS		**VAPOR SAMPLES**
Vacuum Manifold:	_____ " H_2O	Vacuum Manifold Sample No. _____
Air Intake:	_____ " H_2O	Discharge Stack Vapor Sample No. _____
Across Inline Filtration	_____ " H_2O	

COMMENTS:

SVE WELL
PRODUCTION LOG

WELL NO. _____

OPERATOR: _____ DATE: _____

Time	Vacuum	Flow	Vapor Sample

SVE WELL SAMPLING LOG

Operator: _____ Date: _____

SVE WELL	SAMPLE TIME	SAMPLE NUMBER	SAMPLE VOLUME	SAMPLE TYPE *
VE-101				
VE-102				
VE-103				
VE-201				
VE-202				
VE-301				
VE-302				
VE-303				

COMMENTS

* Sample Type = charcoal tube, tedlar bag, glass cylinder, other (explain)

VACUUM MONITORING
WELL LOG

Sheet _____ of _____

Operator: _____ Date: _____

TIME	PARTIAL VACUUM IN INCHES OF WATER COLUMN											
	VM 101		VM 102		VM 103		VM 301		VM 302		VM 303	
	Deep	Shallow	Deep	Shallow	Deep	Shallow	Deep	Shallow	Deep	Shallow	Deep	Shallow

APPENDIX A

SC DHEC BAQC AIR PERMIT WAIVER LETTER

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

December 29, 1992

Mr. David Robb, Project Engineer
RMT, Inc.
P.O. Box 16778
Greenville, SC 29606

Dear Mr. Robb:

The Bureau of Air Quality Control has reviewed the emission information for the proposed Air Stripper and Soil Vapor Extraction System to be located at Medley Farm NPL Site in Gaffney, S.C. Air Dispersion Modeling results indicate that the air toxic emitted (1,1 Dichloroethene) will not result in off-site air concentrations exceeding our Air Toxic Standards (Standard No. 8). Furthermore, since the potential emissions do not exceed 1000 lbs/month, an Air Permit will not be required for the Air Stripper and Soil Vapor Extraction System. This is in accordance with Section I, Part B of Regulation No. 62.5, Standard No. 8.

Sincerely,

Rhonda H. Banks, Permit Engineer
Engineering Services Division
Bureau of Air Quality Control

cc: Ronald Garrett, Appalachia III District
Richard Haynes, SC DHEC

AIR DISPERSION MODELLING SUMMARY SHEET

PROJECT NAME: Medley Farm NPL Site **DATE:** 22 December 1992

LOCATION : Gaffney **REVIEWED BY:** KJC

PERMIT NO. :

MODEL USED : Screen

MODELLED FOR: _____ NAAQS COMPLIANCE _____ PSD INCREMENT
___X___ AIR TOXIC

SOURCES MODELLED: Air Stripper

MODELLING DESCRIPTION:

RESULTS:

POLLUTANT	AVG. TIME	MAX. MODELLED CONCENTRATION ug/m^3	BACKGROUND CONCENTRATION ug/m^3	TOTAL ug/m^3	STANDARD ug/m^3
1,1 Dichloroethene (CAS #75354)					
	24 Hour	1.0	N/A	1.0	99

APPENDIX B

RECORDS AND REPORTING DATA SHEETS

DAILY CHECK OF GROUND WATER REMEDIATION SYSTEM Date ___/___/___

#	CHECK POINT	GAGE READING	COMMENTS	INITIALS
1	Is there any erosion at Jones Creek?			
2	Is the diffuser and all related equipment functioning properly? (Check for turbulence or visible sheen or foam that may indicate problems.)			
3	Flow reading on the discharge pipe			
4	Pressure in the sump tank of the air stripper			
5	Is there any erosion on the grade between the air stripper and the creek?			
6	Pressure reading on System A's centrifugal pump and check for any visible irregularities.			
7	Pressure reading on System B's centrifugal pump and check for any visible irregularities.			
8	a) Pressure into Well 101 (found in well vault)			
	b) Flow into Well 101 (101A)			
	c) Flow out Well 101 (101B)			
9	a) Pressure into Well 102 (found in well vault)			
	b) Flow into Well 102 (102A)			
	c) Flow out Well 102 (102B)			
10	a) Pressure into Well 103 (found in well vault)			
	b) Flow into Well 103 (103A)			
	c) Flow out Well 103 (103B)			
11	a) Pressure into Well 104 (found in well vault)			
	b) Flow into Well 104 (104A)			
	c) Flow out Well 104 (104B)			

* Check all readings with the previous day's and note any differences and reason for that difference.
** For any equipment needing repair, indicate action taken to initiate these repairs.

#		CHECK POINT	GAGE READING	COMMENTS	INITIALS
12	a)	Pressure into Well 105 (found in well vault)			
	b)	Flow into Well 105 (105A)			
	c)	Flow out Well 105 (105B)			
13	a)	Pressure into Well 106 (found in well vault)			
	b)	Flow into Well 106 (106A)			
	c)	Flow out Well 106 (106B)			
14	a)	Pressure into Well 107 (found in well vault)			
	b)	Flow into Well 107 (107A)			
	c)	Flow out Well 107 (107B)			
15	a)	Pressure into Well 201 (found in well vault)			
	b)	Flow into Well 201 (201A)			
	c)	Flow out Well 201 (201B)			
16	a)	Pressure into Well 202 (found in well vault)			
	b)	Flow into Well 202 (202A)			
	c)	Flow out Well 202 (202B)			
17	a)	Pressure into Well 203 (found in well vault)			
	b)	Flow into Well 203 (203A)			
	c)	Flow out Well 203 (203B)			
18	a)	Pressure into Well 204 (found in well vault)			
	b)	Flow into Well 204 (204A)			
	c)	Flow out Well 204 (204B)			

* Check all readings with the previous day's and note any differences and reason for that difference.

** For any equipment needing repair, indicate action taken to initiate these repairs.

WEEKLY CHECK FOR GROUND WATER SYSTEM

Week of ____/____/____ to ____/____/____

#	CHECK POINT	GAGE READING	COMMENTS	INITIALS
1	Is there any vandalism on the system or on the site? (List location and extent of damage.)			
2	Check each tray of the air stripper for any mineral deposits, or bacterial growth; or corrosion.			
3	Is there any erosion across the system? (List location and extent around wells, manholes, piping, concrete equipment pad, near the discharge at the creek.)			
4	Are there any visual indications of fluid leaks near the equipment, piping, or discharge of the system? (treated or untreated ground water, lubricating oils)			

* Check all information with the previous week's recordings and note any major differences.

** For any necessary corrective action, indicate action taken to initiate maintenance.

DAILY CHECK OF SVE SYSTEM

Date ____/____/____

#	CHECK POINT	GAGE READING	COMMENTS	INITIALS
1	Stack: Is there any apparent damage?			
2	Is the discharge silencer functioning normally (are there any unusual noises)?			
3	Pressure between discharge silencer and vacuum pump (PI 1300)			
4	Temperature between discharge silencer and vacuum pump TI 1300			
5	Is the vacuum pump functioning normally?			
6	Is the inlet silencer functioning normally?			
7	What is the pressure reading on the air intake (PI 1202)?			
8	What is the flow reading on the air intake (FI 1202)?			
9	Is the air intake operating normally (how there been any vandalism)?			
10	What is the differential pressure across the in-line filter?			
11	Does the filter function normally? If not, filter may need to be replaced.			
12	Where is the water level in the condensate trap? (If it is at the high port, it must be emptied into air stripper. See maintenance section of O&M.)			
13	Is the condensate trap functioning normally?			
14	Is there any erosion across the system? (Around the wells, piping, or unit.)			

* Check all readings with the previous day's and note any major differences and reason for that difference.

** For any equipment needing repair, indicate action taken to initiate these repairs.

APPENDIX C
TANK DATA SHEET

6 PAGES

INQUIRY FORM

DATE 5/10/93

NAME OF CO RMT

CONTACT GERRY McGRINAP

PHONE 803-281-0030

FAX 803-281-0288

JOB NAME

ENGINEER

M&T Plastics Inc.
6715 JOY DRIVE • EAST SYRACUSE, NY 13057
(315) 432-0550 • FAX (315) 433-0060

GREENVILLE, SC ENGINEERING BUDGET

BIDDING ____ HAS JOB ____ BID DATE ____ ORDER ____ PURCHASE ORDER NO. ____

#TRF128DTS, 8000 GAL STOD FRP VERTICAL STORAGE TANK, FLAT BOTTOM, DOME TOP $7640.00EA

TO INCLUDE THE FOLOWING:

1 EA #5137I, 18" QUICK ACCESS
1 EA #5155D, #5058J, 4" U-VENT W/CPLG
1 EA #5058D, 2 FLDC, NON GUSSKETED
3 EA #5058F, 3
1 EA #5058H, 6
1 EA #5058J, 8

F.O.B. SIOUX FALLS, SD
6-8 WKS AFTER DRAWING APPROVAL.

Jocelyn Bailey
5/10/93

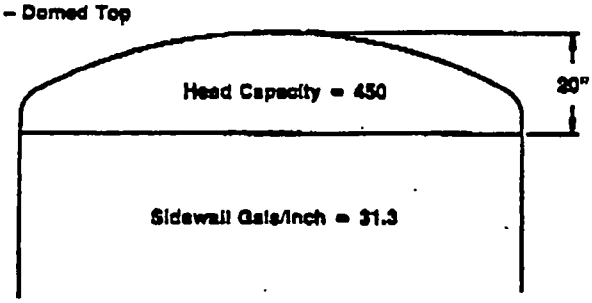
SENT BY: ; 5-10-93 ; 16:07 ; 3154330080→ #1 P. 8

Flat Bottom Domed Top

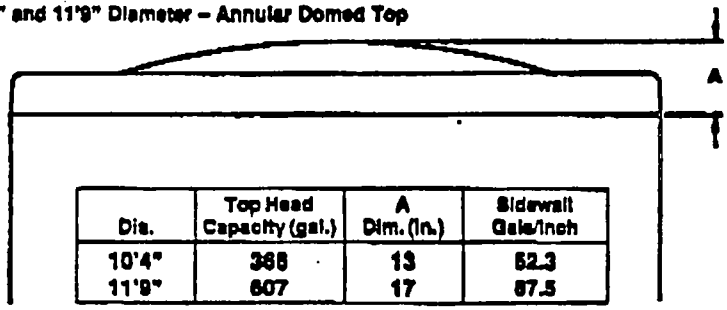
Part No.	Nominal Capacity (gal.)	Diameter x Height (in.)	Approx. Wall* Thickness (in.)	Approx. Weight (lbs.)
F082DT	2000	8' x 6'4"	1/4	840
F083DT	3000	8' x 9'	1/4	980
F084DT	4000	8' x 11'8"	1/4	1140
F104DT	4000	10'4" x 7'1"	1/4-9/32	1075
F086DT	6000	8' x 14'3"	1/4-9/32	1280
F106DT	6000	10'4" x 8'8"	1/4-9/32	1206
F088DT	8000	8' x 16'11"	1/4-9/32	1520
F108DT	8000	10'4" x 10'3"	1/4-11/32	1336
F126DT	8000	11'9" x 8'1"	1/4-5/16	1375
F087DT	7000	8' x 19'7"	1/4-9/32	1710
F107DT	7000	10'4" x 11'10"	1/4-11/32	1480
F127DT	7000	11'9" x 9'4"	1/4-5/16	1500
F088DT	8000	8' x 22'3"	1/4-11/32	1900
F108DT	8000	10'4" x 13'5"	1/4-11/32	1647
F128DT	8000	11'9" x 10'7"	1/4-5/16	1625
F109DT	9000	10'4" x 15'	1/4-11/32	1813
F129DT	9000	11'9" x 11'10"	1/4-5/16	1768
F1010DT	10000	10'4" x 16'7"	1/4-7/16	1988
F1210DT	10000	11'9" x 13'1"	1/4-3/8	1910
F1012DT	12000	10'4" x 19'10"	1/4-7/16	2390
F1212DT	12000	11'9" x 15'6"	1/4-3/8	2215
F1014DT	14000	10'4" x 23'	1/4-1/2	2820
F1214DT	14000	11'9" x 18'	1/4-7/16	2585
F1015DT	15000	10'4" x 24'7"	1/4-1/2	3100
F1215DT	15000	11'9" x 19'2"	1/4-7/16	2750
F1216DT	16000	11'9" x 20'5"	1/4-7/16	2935
F1218DT	18000	11'9" x 22'11"	1/4-1/2	3350
F1220DT	20000	11'9" x 25'5"	1/4-1/2	3580
F1221DT	21000	11'9" x 26'8"	1/4-1/2	3800
F1222DT	22000	11'9" x 27'11"	1/4-19/32	4410
F1225DT	25000	11'9" x 31'7"	1/4-5/8	5550
F1230DT	30000	11'9" x 37'9"	1/4-23/32	6950

*Walls are tapered

8' Diameter – Domed Top

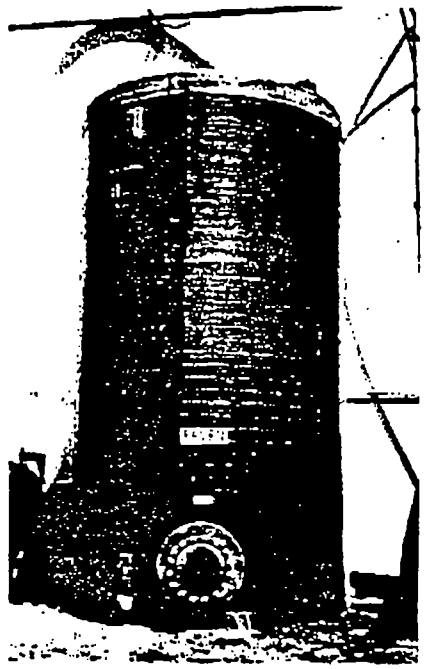


10'4" and 11'9" Diameter – Annular Domed Top



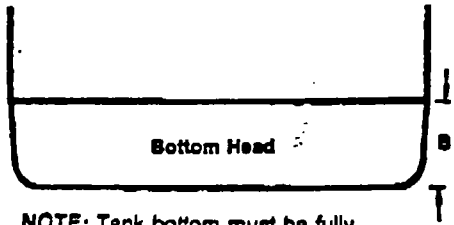
Dia.	Top Head Capacity (gal.)	A Dim. (in.)	Sidewall Gals/inch
10'4"	368	13	52.3
11'9"	607	17	67.5

Chop-hoop Filament Wound Flat Bottom Domed Top Fiberglass Tanks

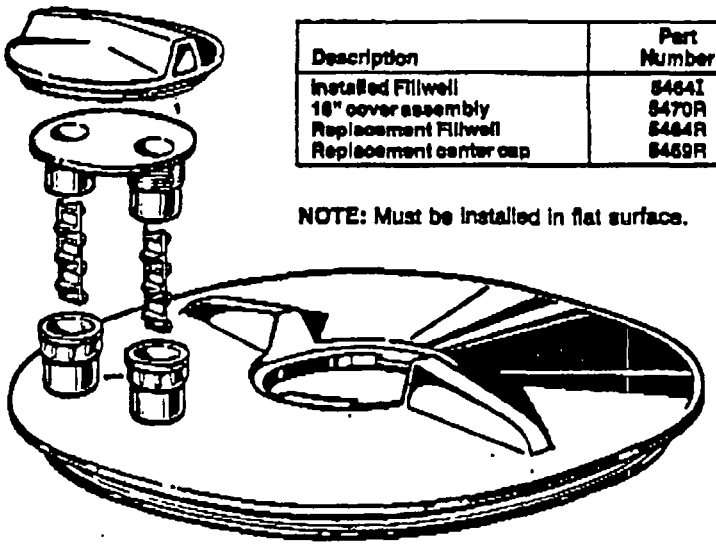


- Domed top tanks are designed for atmospheric pressure only and must be vented. Refer to venting specifications on page D5.
- Standard tank is designed for 1.3 specific gravity material. 1.8 and 2.1 versions are available upon request.
- All filament wound tanks include three lift lugs.
- For accessories refer to pages D1-14.
- For resin selection see pages E1-E4.
- For warranty information see page E5.

Dia.	Bottom Head Capacity (gal.)	B Dim. (in.)
8'	240	6
10'4"	386	7
11'9"	607	9



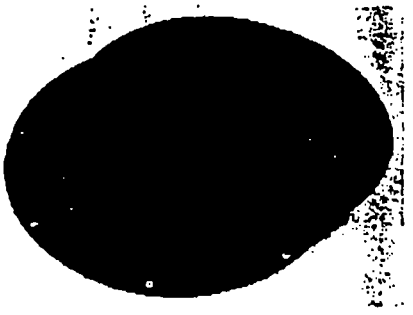
NOTE: Tank bottom must be fully supported and pad must remain level within 1/8" over a ten foot span. Consult a local engineer for specific site requirements.



Description	Part Number
Installed Fillwell	5464I
16" cover assembly	5470R
Replacement Fillwell	5464R
Replacement center cap	5469R

NOTE: Must be installed in flat surface.

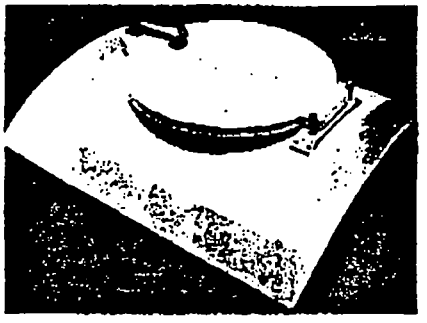
16" Fillwells and Covers

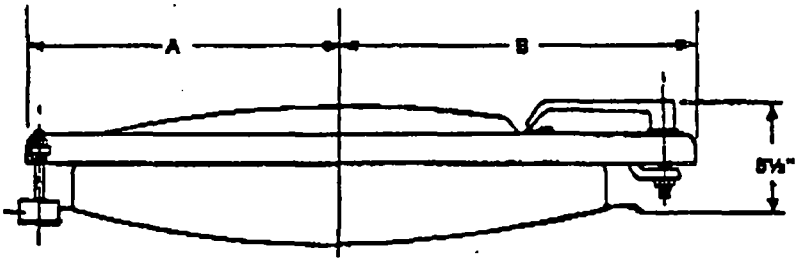


- Polypropylene 16" threaded fillwells feature large precision threads and are ideal for oval and vertical polyethylene tanks where inside access is required.

Description	18" Diameter	24" Diameter
Installed manway	5137I	5247I
Replacement manway	5137R	5247R
Replacement cover only	5138R	5248R
Latch assembly only (plated zinc)	5140R*	5140R*
Hinge assembly only (stainless steel)	5141R	5141R
Gasket (neoprene)	5144R	5246R

Hinged Quick Access Manways 18" and 24"



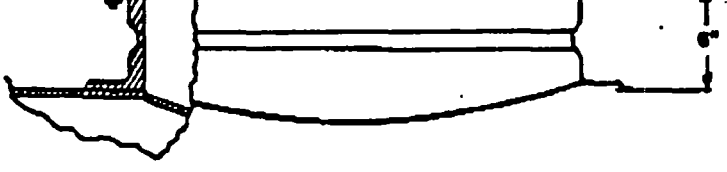


- Available in either 18" or 24" diameter, hinged quick access manways provide quick and easy access to fiberglass tanks for above liquid level service.

*CAUTION: When HCL acid is present a fiberglass latch is required! Contact factory for details.

Dia. (in.)	Part No.	No. Bolts	X (in.)
24	5118I	8	28¼s
32	5119I	8	36¼

Bolt Down Manways (Above liquid level) 24" and 32"



- Available in either 24" or 32" size, the bolt down manway features a 3/8" thick FRP cover fastened to a 3/8" flanged lip and can be located anywhere above liquid level that does not interfere with a head seam.

CAUTION: Tank must be vented to atmosphere when manway is installed.

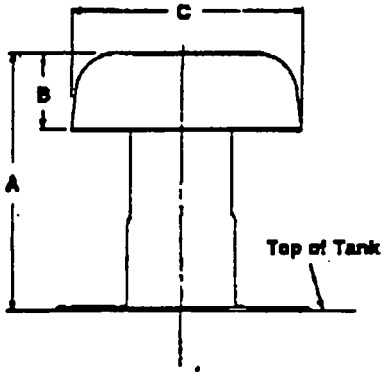
CAUTION!

All Raven tanks are designed for atmospheric pressure only and must be positively vented. Raven Industries, Inc. assumes no liability for any tank vented improperly.

VENTING INFORMATION

All closed top tanks must have a vent of equal or greater size than the largest inlet or outlet. In addition to a standard vent, tanks being loaded by air pressure must have a minimum 18" quick access manway open and hold down lugs in use in order to prevent over pressurization and potential failure. Precautions must also be taken to avoid vacuum. If there is any question concerning the adequacy of the venting system contact the factory for recommendations.

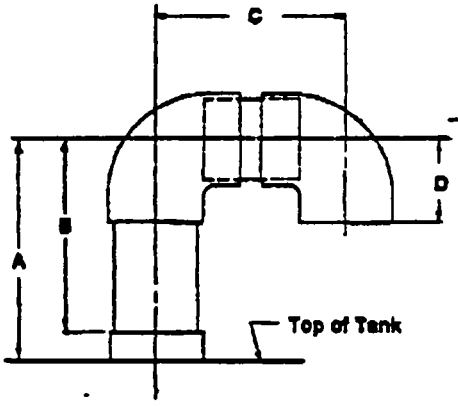
FRP Mushroom Vents



Pipe Size (in.)	Part No.	A (in.)	B (in.)	C (in.)
2	5283D	7⅞	1⅝	6
4	5283Q	8⅛	2¾	8½
8	5283J	11⅛	4¼	14

- Mushroom vents are constructed from corrosion-resistant vinyl ester resin and are permanently bonded directly to the top of the tank.
- Vent screen to keep out birds and bugs is available upon request. Contact factory for details.

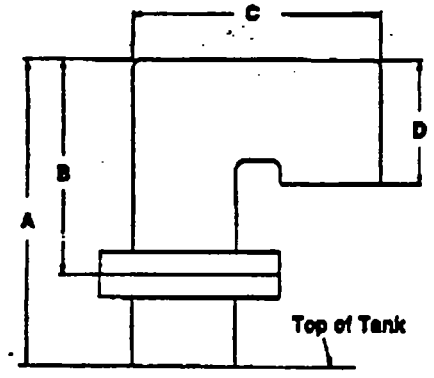
FRP U-Vents 2" • 3" • 4"



Pipe Size (in.)	Part No.	A (in.)	B (in.)	C (in.)	D (in.)
2	5155B	12	10	8	3.8
3	5155C	12	10.5	10	4.5
4	5155D	12	11.2	11	5

- 2", 3", and 4" U-vents are threaded into a fiberglass coupling bonded into tank wall or head. When ordering refer to page D6 to include correct part no. for the coupling. Example: The correct part numbers to order a 2" U-vent would be 5155B (U-vent) + 5059F (2" coupling).

FRP U-Vents 6" • 8"



Pipe Size (in.)	Part No.	A (in.)	B (in.)	C (in.)	D (in.)
6	5155E	20	14	16	8
8	5155F	22	20	22	12

- 6" and 8" U-vents are bolted to the corresponding size flange (Page D7) that is bonded into the tank wall or head. The flange is not included and must be ordered separately. Example: correct part numbers to order an 8" U-vent would be 5155F (Vent) + 5269J (conically-gusseted flange).*

*NOTE: Customer can use either non-gusseted or gusseted flanges for U-vent base.

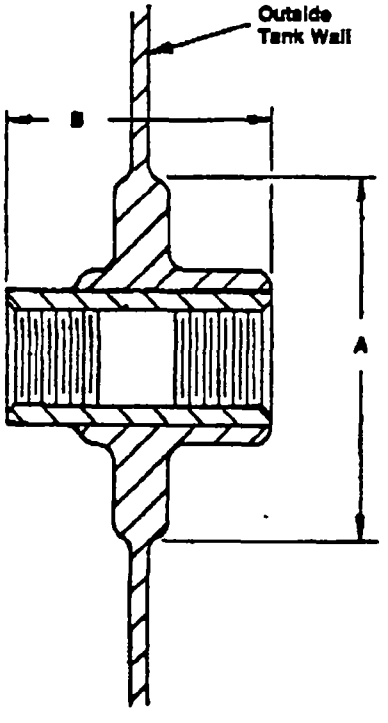
Part No.	Pipe Size (in.)	Actual OD (in.)	Full or Half Dim. A (in.)	Full Dim. B (in.)	Half Dim. D (in.)
5059B	½	1¼	4	4⅜	2⅛
5059C	¾	1⅝	5	4⅛	2⅛
5059D	1	1⅞	6	4⅜	2⅛
5059E	1½	2½	8	4⅜	2⅛
5059F	2	3	9	4½	2⅛
5059G	2½	3⅝	10	4½	2⅛
5059H	3	4⅛	13	4⅜	2⅛
5059J	4	5	15	4⅜	2⅛
5059K	6	6½	20	4½	2⅛

Full and Half FRP Couplings

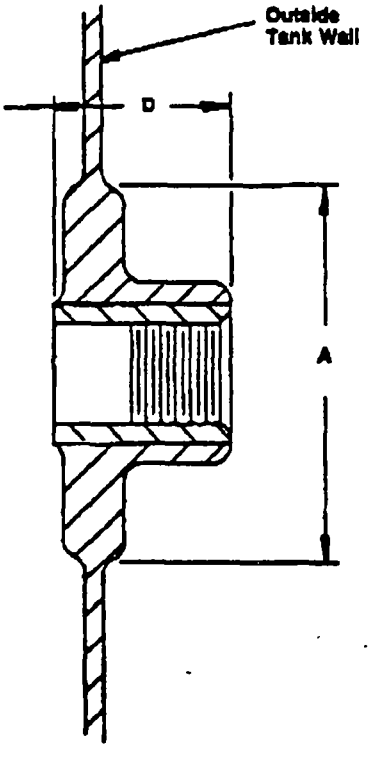
Fiberglass female pipe threaded couplings are bonded permanently into the tank to eliminate potential leak problems. Full and half couplings are available in sizes from 1/2" to 6" and can be located anywhere on the tank except the saddle assembly contact area on horizontal fiberglass tanks.

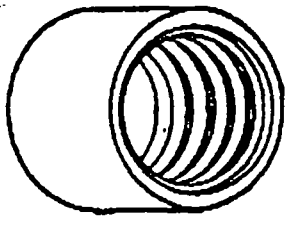
- Manufactured from corrosion-resistant vinyl ester resin.
- Outside bonding area at the coupling is equal to or greater than tank wall thickness.
- Inside surface is sealed with 2 layers of 1½ oz. glass mat and the same resin as the tank wall on all tanks 60" diameter and larger. On smaller diameters inside sealing may not be possible unless tank is equipped with a manway.
- All side wall penetrations protrude as shown unless otherwise specified.
- Bottom fittings are flush mounted for complete drainage.
- Full couplings provide for internal piping. Please specify either full or half when ordering.

FRP FULL COUPLING



FRP HALF COUPLING





Flanged Connections

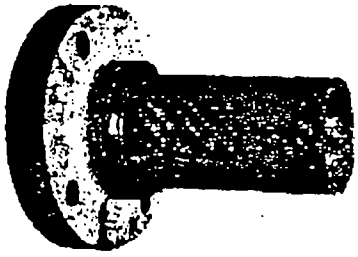
Press molded vinyl ester flanges with cast vinyl ester pipe are available in sizes from 1" to 24" and are permanently bonded to the tank. Flanges can be located either above or below liquid level and can be ordered in three different styles based upon intended use.

Pipe Size	Non Gusset	Blade Gusset	Conical Gusset	A Dim. (in.)	B Dim. (in.)	C Dim. (in.)	D Dim. (in.)	E Dim. (in.)	Bolt Holes* No.-size
1	5058B	5174B	5269B	4½	3⅛	⅝	⅞	4	(4) ½
1½	5058C	5174C	5269C	5	3⅞	⅝	1⅜₁₆	4	(4) ½
2	5058D	5174D	5269D	6	4¾	¾	1¾₁₆	4	(4) ⅝
3	5058F	5174F	5269F	7½	6	¾	1¾₁₆	4	(4) ⅝
4	5058G	5174G	5269G	9	7½	¾	1½	4	(8) ⅝
6	5058H	5174H	5269H	11	9½	⅞	1¾₁₆	6	(8) ¾
8	5058J	5174J	5269J	13½	11¾	⅞	2	6	(8) ¾
10	5058K	NA	NA	16	14¼	1	2	6	(12) ⅞
12	5058L	NA	NA	19	17	1	3¼₁₆	6	(12) ⅞
14	5058M	NA	NA	21	18¾	1⅛	1¼₁₆	8	(12) 1
16"	5058P	NA	NA	25	22¾	1¼	1¼	8	(16) 1⅛
24"	5123I	NA	NA	32	29¼	1⅜	1½	8	(20) 1¼

* Flange must include appropriate blind flange page (D8) if used as below liquid level access.

- Gaskets, bolts, washers, and nuts are not included with flanges. Raven recommends the use of a 40 to 60 durometer full faced gasket, 1/8" thick, and a maximum bolt take up torque of 30 ft.-lbs.
- Flange face is 150 lb. A.S.A. bolting geometry.
- Sidewall mounted flanges protude a minimum of 1" as shown. Bottom flanges are flush mounted unless otherwise specified.

Non-Gusseted Flanges



Non-gusseted flanges through 8" pipe size are designed for light duty, non-weight bearing applications on tanks 72" diameter or smaller. Raven recommends the use of gusseted flanges on all tanks 90" diameter and larger.

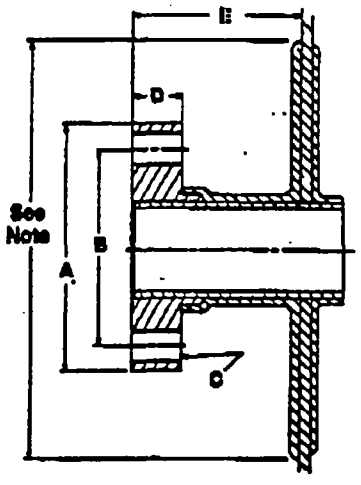
Blade-Gusseted Flanges

Blade-gusseted flanges are reinforced by flat fiberglass plates bonded the full length of the flange assembly. They are recommended for heavy-duty applications where ease of access to the back of the flange face is important.

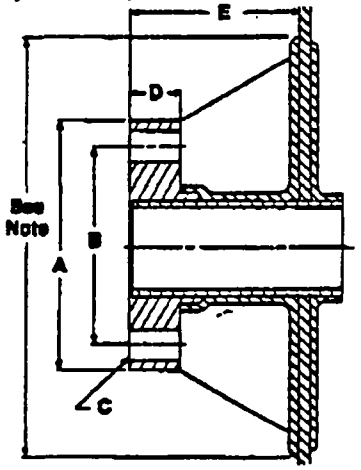
Conically-Gusseted Flanges

Conically gusseted flanges are reinforced by a fiberglass bonded cone and are recommended for applications where maximum strength is required.

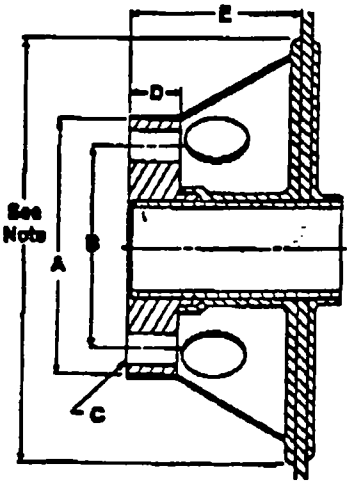
NON-GUSSETED FLANGES



BLADE-GUSSETED FLANGES



CONICALLY-GUSSETED FLANGES



NOTE: Bonding area equals three times the nominal pipe size on all pipe through 8". On 10" through 24", patch width is 16" larger than pipe size.

APPENDIX D

PUMP DATA SHEET - GW

The following information has been obtained from the Gould's Pump Operation and Maintenance Manual. Refer to this manual for specifics.

GENERAL INFORMATION

PUMP DESCRIPTION

The Model 3196 is a horizontal overhung, open impeller centrifugal pump that meets requirements of ANSI B73.1.

The model is based on 5 power ends and 28 hydraulic pump sizes. Groupings are as follows:

STX	5 pump sizes
MTX	15 pump sizes
LTX	11 pump sizes
XLT-X	5 pump sizes
X-17	3 pump sizes

Casing - The casing is top centerline discharge and self-venting. The gasket is fully confined. An integral foot support is used for maximum resistance to misalignment and distortion from piping loads. ANSI flat face serrated flanges are standard. ANSI Class 150 raised face serrated, ANSI Class 300 flat face serrated and ANSI Class 300 raised face serrated are available.

Impeller - The impeller is fully open and threaded to the shaft. The threads are sealed from the pumpage by a Teflon O-ring.

Seal Chamber/Stuffing-Box Cover - The 3196 is available with a stuffing box cover designed for packing and Big Bore™ seal chamber or TaperBore™ seal chamber for improved performance of mechanical seals.

Frame Adapter - The ductile iron frame adapter has machined rabbet fit to the seal chamber/stuffing box cover and precision dowel pin fit to the bearing frame.

Power End - Oil level is viewed through a sight glass. Optional oil cooling is provided by a finned tube. Flood oil lube is standard. The power end is sealed with Goulds designed labyrinth seals. No machining is required to convert from oil to grease or oil mist. Regreasable bearings, greased for life bearings and oil mist lubrication are optional.

Shaft - The shaft is available with or without sleeve.

Bearings - The inboard bearing carries only radial load, it is free to float axially in the frame. The outboard bearing is shouldered and locked to the shaft and housing to enable it to carry radial and thrust loads. All fits are precision machined to industry standards. The inboard bearing is a single row deep groove ball bearing. The outboard bearing is a double row angular contact bearing, except for the LTX which uses a pair of single row angular contact ball bearings mounted back to back.

Dynamic Seal - A dynamic seal is available which uses a repeller to pump liquid out of the stuffing box while the pump operates, a static seal prevents leakage when the pump is shut down.

Direction of Rotation - Clockwise (right hand) as viewed from the driver, looking at the pump shaft.

NAMEPLATE INFORMATION

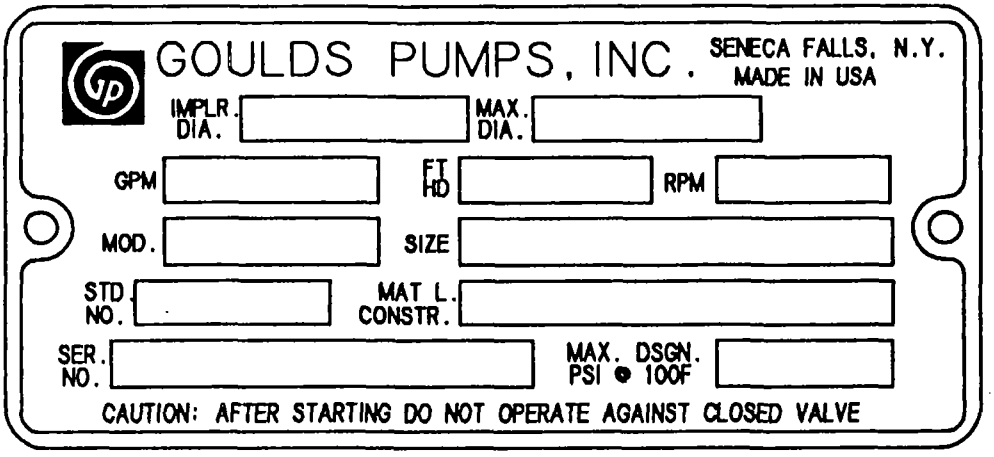


Fig. 1

Every pump has two Goulds nameplates that provide information about the pump. The tags are located on the casing and bearing frame.

Pump Casing Tag - provides information about the pump's hydraulic characteristics. Note the format of the pump size: Discharge x Suction - Nominal maximum Impeller Diameter in inches. (Example: 2x3-6)(Fig. 1)

Bearing Frame Tag - provides information on the lubrication system used. (Fig. 2).

When ordering spare parts you will need to identify pump model, size, serial number, and the item number of required parts. Information can be taken from the pump casing tag. Item numbers can be found in this manual.

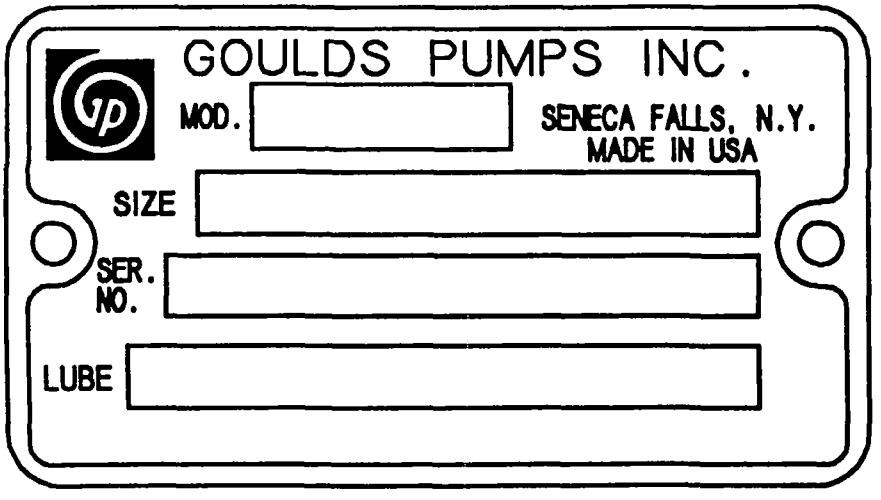


Fig. 2

RECEIVING THE PUMP

Inspect the pump as soon as it is received. Carefully check that everything is in good order. Make notes of damaged or missing items on the receipt and freight bill. File any claims with the transportation company as soon as possible.

Storage Requirements

Short Term: (Less than 6 months) Goulds normal packaging procedure is designed to protect pump during shipping. Upon receipt store in a covered and dry location.

Long Term: (More than 6 months) Preservative treatment of bearings and machined surfaces will be required. Rotate shaft several times every 3 months. Refer to driver and coupling manufacturers for their long term storage procedures. Store in a covered dry location.

NOTE: Long term storage treatment can be purchased with initial pump order.

Handling

WARNING

Pump and components are heavy. Failure to properly lift and support equipment could result in serious physical injury, or damage to pumps.

Use care when moving pumps. Lifting equipment must be able to adequately support the entire assembly. Hoist bare pump using a suitable sling, under the suction flange and bearing frame. Baseplate mounted units are moved with slings under the pump casing and driver. Refer to figures 3A,B,C for examples of proper lifting techniques.

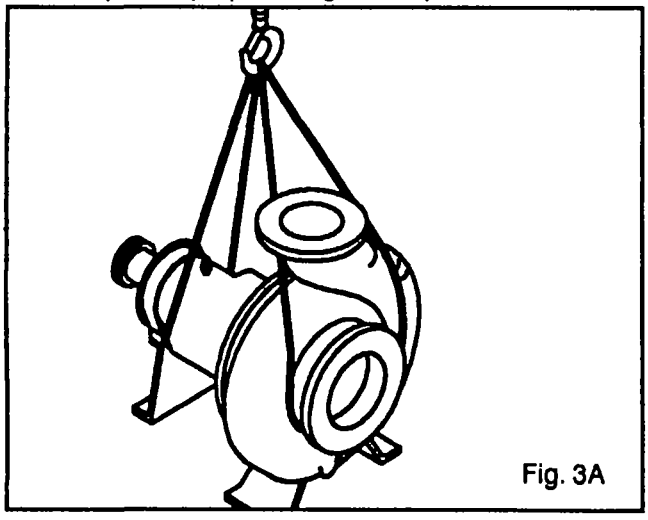


Fig. 3A

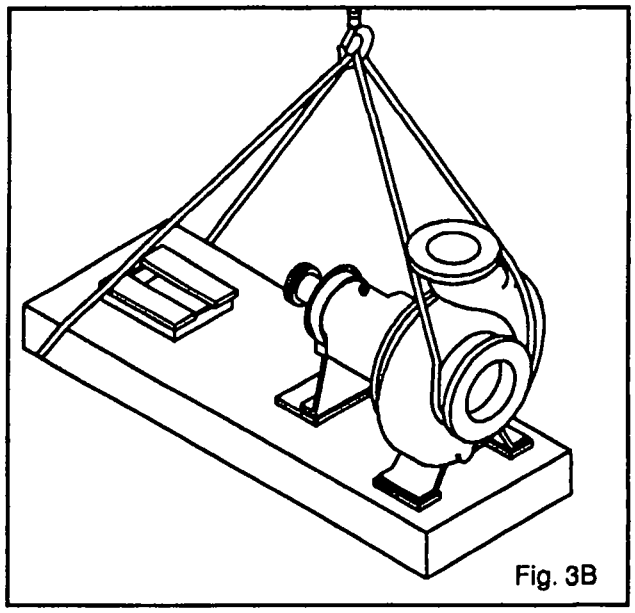


Fig. 3B

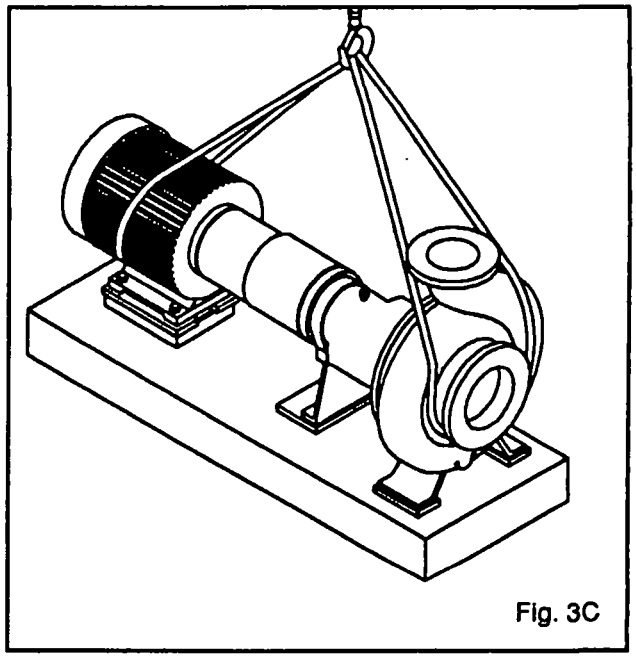


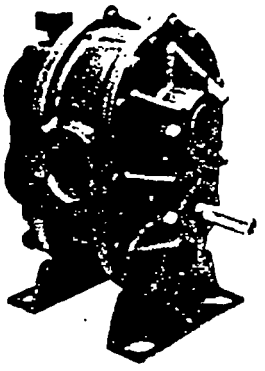
Fig. 3C

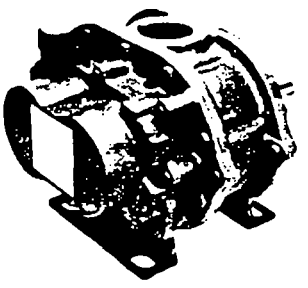
APPENDIX E

PUMP DATA SHEET - SVE

TROUBLE SHOOTING CHECKLIST

TROUBLE	ITEM	POSSIBLE CAUSE	REMEDY
No Air Flow	1	Speed too low	Check by tachometer and compare with speed shown on Roots Order Acknowledgement.
	2	Wrong rotation	Compare actual rotation with Figure 2. Change driver if wrong.
	3	Obstruction in piping	Check piping, screen, valves, silencer, to assure an open flow path.
Low capacity	4	Speed too low	See item 1. If belt drive, check for slippage and readjust tension.
	5	Excessive pressure	Check inlet vacuum and discharge pressure, and compare these figures with specified operating conditions on Order.
	6	Obstruction in piping	See item 3.
	7	Excessive slip	Check inside of casing for worn or eroded surfaces causing excessive clearances.
Excessive Power	8	Speed too high	Check speed and compare with Roots Order Acknowledgement.
	9	Pressure too high	See item 5.
	10	Impellers rubbing	Inspect outside of cylinder and headplates for high temperatures areas, then check for impeller contacts at these points. Correct blower mounting, drive alignment.
Overheating of Bearings, or Gears	11	Inadequate lubrication	Restore correct oil levels in gearbox and lubricate.
	12	Excessive lubrication	Check gear oil level. If incorrect, drain and refill with clean oil of recommended grade.
	13	Excessive pressure rise	See item 5.
	14	Coupling misalignment	Check carefully. Realign if questionable.
	15	Excessive belt tension	Readjust for correct tension.
	16	Speed too low	Speeds lower than the minimum recommended will overheat the entire blower.
Vibration	17	Misalignment	See item 14.
	18	Impellers rubbing	See item 10.
	19	Worn bearings/gears	Check gear backlash and condition of bearings.
	20	Unbalanced or rubbing impellers	Scale or process material may build up on casing and impellers, or inside impellers. Remove build-up to retore original clearances and impeller balance.
	21	Driver or blower loose	Tighten mounting bolts securely.
	22	Piping resonances	Determine whether standing wave pressure pulsations are present in the piping. Refer to Distributors.





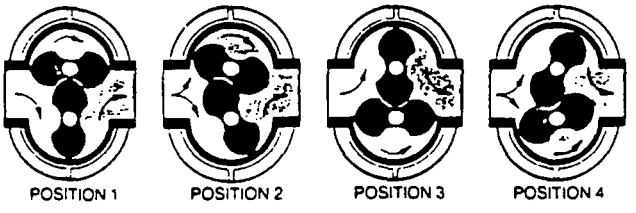
SPECIFICATIONS

Roots Universal RAI®

Rotary Positive Blowers

FRAME 22 thru 718

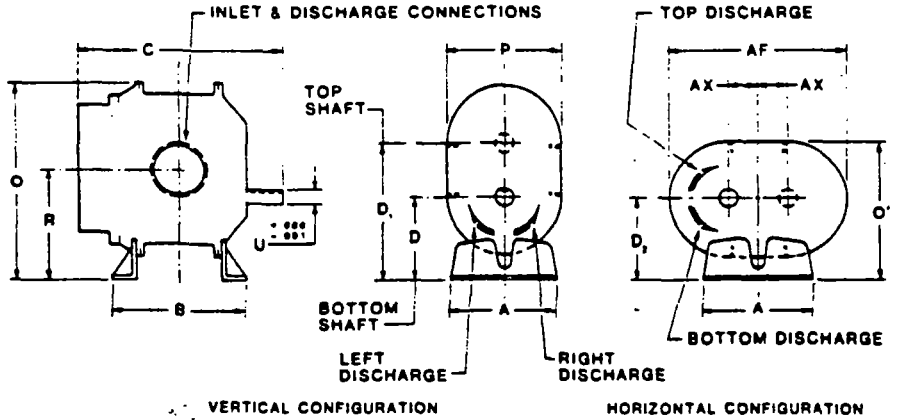
OPERATING PRINCIPLE



Two figure eight lobe impellers mounted on parallel shafts rotate in opposite directions. As each impeller passes the blower inlet, it traps a definite volume of air and carries it around the case to the blower outlet, where the air is discharged. With constant speed operation, the displaced volume is essentially the same regardless of pressure, temperature or barometric pressure.

Timing gears control the relative position of the impellers to each other and maintain small but definite clearances. This allows operation without lubrication being required inside air casing.

OUTLINE DRAWING & DIMENSIONAL TABLE



VERTICAL CONFIGURATION — HORIZONTAL CONFIGURATION

Frame Size	A	B	C	Drive Shaft Location: D Bottom Shaft	D, Top Shaft	D, Horiz. Shaft	O	O'	P	R	U	Keyway	Inlet & Disch. Dia.	AF	AX	Approx. Net Wt. (Lbs.)
22	5.13	5.00	9.75	3.75	6.25	3.75	9.63	6.88	6.25	5.00	.625	.188 x .094	1.0 NPT	9.25	1.25	32
24	5.13	7.00	11.75	3.75	6.25	3.75	9.63	6.88	6.25	5.00	.625	.188 x .094	2.0 NPT	9.25	1.25	43
33	7.25	7.63	12.13	5.00	8.50	5.00	12.81	8.88	7.75	6.75	.750	.188 x .094	2.0 NPT	12.13	1.75	74
36	7.25	10.00	14.63	5.00	8.50	5.00	12.81	8.88	7.75	6.75	.750	.188 x .094	2.5 NPT	12.13	1.75	102
42	8.00	7.25	13.00	6.25	10.25	6.25	15.06	10.63	8.75	8.25	.875	.188 x .094	1.5 NPT	13.63	2.00	88
45	8.00	10.00	15.50	6.25	10.25	6.25	15.06	10.63	8.75	8.25	.875	.188 x .094	2.5 NPT	13.63	2.00	109
47	8.00	11.75	17.63	6.25	10.25	6.25	15.06	10.50	8.50	8.25	.875	.188 x .094	3.0 NPT	13.63	2.00	128
53	10.50	8.38	15.38	6.25	11.25	6.75	17.38	11.88	10.25	8.75	1.125	.250 x .125	2.5 NPT	17.25	2.50	143
56	10.50	11.00	18.00	6.25	11.25	6.75	17.38	12.25	11.00	8.75	1.125	.250 x .125	4.0 NPT	17.25	2.50	170
59	10.50	14.00	21.18	6.25	11.25	6.75	17.38	12.25	11.00	8.75	1.125	.250 x .125	4.0 NPT	17.25	2.50	204
65	11.00*	10.00	18.38	8.75	14.75	8.75	21.63	15.13	12.75	11.75	1.375	.312 x .156	3.0 NPT	19.75	3.00	245
68	11.00*	13.00	21.38	8.75	14.75	8.75	21.63	15.13	12.75	11.75	1.375	.312 x .156	5.0 NPT	19.75	3.00	285
615	11.00*	20.00	28.38	8.75	14.75	8.75	21.63	16.25	15.00	11.75	1.375	.312 x .156	6.0 FLG	19.75	3.00	425
76	14.00**	11.75	19.94	11.00	18.00	11.00	26.13	20.69	19.38	14.50	1.562	.375 x .188	4.0 NPT	23.25	3.50	400
711	14.00**	16.75	25.19	11.00	18.00	11.00	26.13	19.50	17.00	14.50	1.562	.375 x .188	6.0 FLG	23.25	3.50	530
718	14.00**	23.75	32.19	11.00	18.00	11.00	26.13	19.50	17.00	14.50	1.562	.375 x .188	8.0 FLG	23.25	3.50	650

* 17.00 in horizontal configuration
** 21.00 in horizontal configuration

All dimensions in inches

BASIC BLOWER DESCRIPTION

Universal RAI blowers are heavy duty rotary blowers designed with detachable rugged steel mounting feet, which permit easy in-field adaptability to either vertical or horizontal installation requirements. The Universal RAI blowers can even be hung from overhead supports.

Because of the detachable mounting feet, these units can be easily adapted to any of four drive shaft positions — right hand, left hand, bottom or top. The compact, sturdy design is engineered for continuous service when operated in accordance with speed and pressure ratings.

The basic model consists of a cast iron casing, hardened alloy steel gears secured to steel shafts with a taper mounting and locknut, and cast iron involute impellers. Anti-friction bearings are used, with an oversized cylindrical roller bearing at the drive shaft on all except the two smallest sizes to withstand V-belt pull. All other bearings are oversized ball bearings. The Universal RAI features thrust control, with splash oil lube on the gear end and grease lube on the drive end. After standard tests, the unit is sprayed with a protective paint and boxed or placed on skids.

Available accessories include driver, relief valve, inlet and discharge silencer, inlet filter, check valve, extended base, V-belt or flexible coupling and drive guards.

EVERY GROWING PLANT NEEDS ROOTS

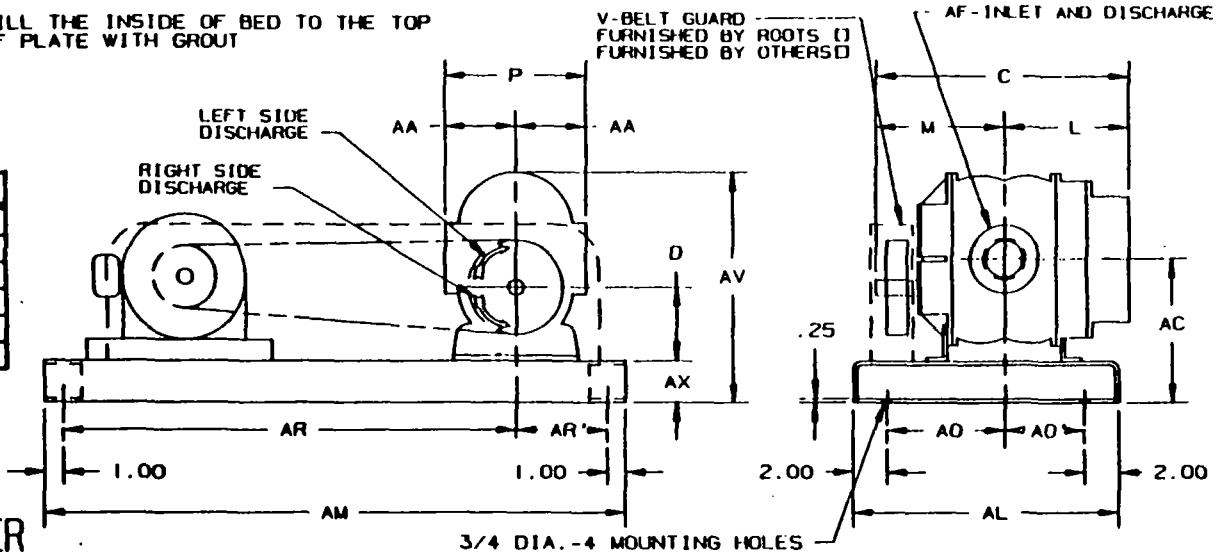
FLANGE DRILLING
125 LB ANSI

	6"FLG	8"FLG
OPENING	6.00	8.00
BOLT CIRCLE	9.50	11.75
FLANGE O.D.	11.00	13.50
No TAPPED HOLES	8	8
SIZE HOLES	3/4-10	3/4-10
TAP DEPTH	1.13	1.13

U-BLOWER SHAFT DIA. $^{.000}_{.001}$

AD-MAX. BLOWER SHEAVE WIDTH

AE-MIN. BLOWER SHEAVE DIA.



MOTOR DATA
HP
RPM
PHASE
HZ
VOLTAGE
FRAME
MANUFACTURER
V-BELT DRIVE DATA
BELTS
DRIVE SHEAVE
DRIVEN SHEAVE
CENTER DISTANCE

U-RAI SIDE OUTLET BLOWER

ALL DIMENSIONS IN INCHES

SIZE	MOTOR FRAME	C	D	L	M	P	U	KEYWAY	AA	AC	AD	AE	AF	AL	AM	AO	AO'	AR	AR'	AV	AX
22	56, 143T, 145T, 182T	9.75	3.75	4.63	5.13	6.25	.625	.188 x .094	3.13	8.00	1.75	4.00	1" NPT	20.00	41.00	8.00	8.00	32.50	6.50	12.63	3.00
24	56, 143T, 145T, 182T	11.75	3.75	5.63	6.13	6.25	.625	.188 x .094	3.13	8.00	1.75	4.00	2" NPT	20.00	41.00	8.00	8.00	32.50	6.50	12.63	3.00
33	56, 143T, 145T, 182T, 184T, 213T	12.13	5.00	5.88	6.25	7.75	.750	.188 x .094	3.88	9.75	1.91	5.00	2" NPT	29.00	46.00	12.00	13.00	35.00	9.00	15.81	3.00
36	56, 143T, 145T, 182T, 184T, 213T	14.63	5.00	7.06	7.56	7.75	.750	.188 x .094	3.88	9.75	1.91	5.00	2-1/2" NPT	29.00	46.00	12.00	13.00	35.00	9.00	15.81	3.00
42	56, 143T, 145T, 182T, 184T, 213T, 215T	13.00	6.25	6.13	6.88	8.75	.875	.188 x .094	4.38	11.25	2.31	5.00	1-1/2" NPT	29.00	46.00	12.00	13.00	35.00	9.00	18.06	3.00
45	56, 143T, 145T, 182T, 184T, 213T, 215T	15.50	6.25	7.50	8.00	8.75	.875	.188 x .094	4.38	11.25	2.31	5.00	2-1/2" NPT	29.00	46.00	12.00	13.00	35.00	9.00	18.06	3.00
47	143T, 145T, 182T, 184T, 213T, 215T	17.63	6.25	8.38	9.25	8.50	.875	.188 x .094	4.25	11.25	2.31	5.00	3" NPT	29.00	46.00	12.00	13.00	35.00	9.00	18.06	3.00
53	143T, 145T, 182T, 184T, 213T, 215T, 254T, 256T	15.38	6.25	7.19	8.19	10.25	1.125	.250 x .125	5.13	12.75	3.06	6.00	2-1/2" NPT	31.00	51.00	14.00	13.00	38.50	10.50	21.38	4.00
56	143T, 145T, 182T, 184T, 213T, 215T, 254T, 256T	18.00	6.25	8.81	9.19	11.00	1.125	.250 x .125	5.50	12.75	3.06	6.00	4" NPT	31.00	51.00	14.00	13.00	38.50	10.50	21.38	4.00
➔ 59	145T, 182T, 184T, 213T, 215T, 254T, 256T	21.19	6.25	9.81	11.19	11.00	1.125	.250 x .125	5.50	12.75	3.06	6.00	4" NPT	31.00	51.00	14.00	13.00	38.50	10.50	21.38	4.00
65	184T, 213T, 215T, 254T, 256T, 284T, 286T	18.38	8.75	9.19	9.19	12.75	1.375	.313 x .156	6.38	15.75	3.44	8.00	3" NPT	31.00	51.00	14.00	13.00	38.50	10.50	25.63	4.00
68	184T, 213T, 215T, 254T, 246T	21.38	8.75	10.56	10.81	12.75	1.375	.313 x .156	6.38	15.75	3.44	8.00	5" NPT	31.00	51.00	14.00	13.00	38.50	10.50	25.63	4.00
68	284T, 286T, 324T	21.38	8.75	10.56	10.81	12.75	1.375	.313 x .156	6.38	15.75	3.44	8.00	5" NPT	44.50	61.00	23.00	17.50	48.50	10.50	25.63	4.00
615	213T, 215T, 254T, 256T, 284T, 286T, 324T	28.38	8.75	14.06	14.31	15.00	1.375	.313 x .156	7.50	15.75	3.44	8.00	6" FLG	44.50	61.00	23.00	17.50	48.50	10.50	25.63	4.00
76	213T, 215T, 254T, 256T, 284T, 286T, 324T, 326T	19.94	11.00	9.94	10.00	19.38	1.563	.375 x .188	9.69	18.50	3.75	9.50	4" NPT	44.50	61.00	23.00	17.50	48.50	10.50	30.13	4.00
711	213T, 215T, 254T, 256T, 284T, 286T, 324T, 326T, 364T	25.19	11.00	12.44	12.75	17.00	1.563	.375 x .188	8.50	18.50	3.75	9.50	6" FLG	44.50	61.00	23.00	17.50	48.50	10.50	30.13	4.00
718	215T, 254T, 256T, 284T, 286T, 324T, 326T, 364T	32.19	11.00	15.94	16.25	17.00	1.563	.375 x .188	8.50	18.50	3.75	9.50	8" FLG	44.50	81.00	23.00	17.50	65.00	14.00	30.13	4.00

CERTIFIED CORRECT FOR
CUSTOMER ORDER No. _____
ROOTS ORDER No. _____
DATE _____

REM 7/16/87

ROOTS (DRESSER)
DRESSER INDUSTRIES, INC.
ROOTS DIVISION
900 WEST MOUNT STREET
CONNERSVILLE, INDIANA 47331

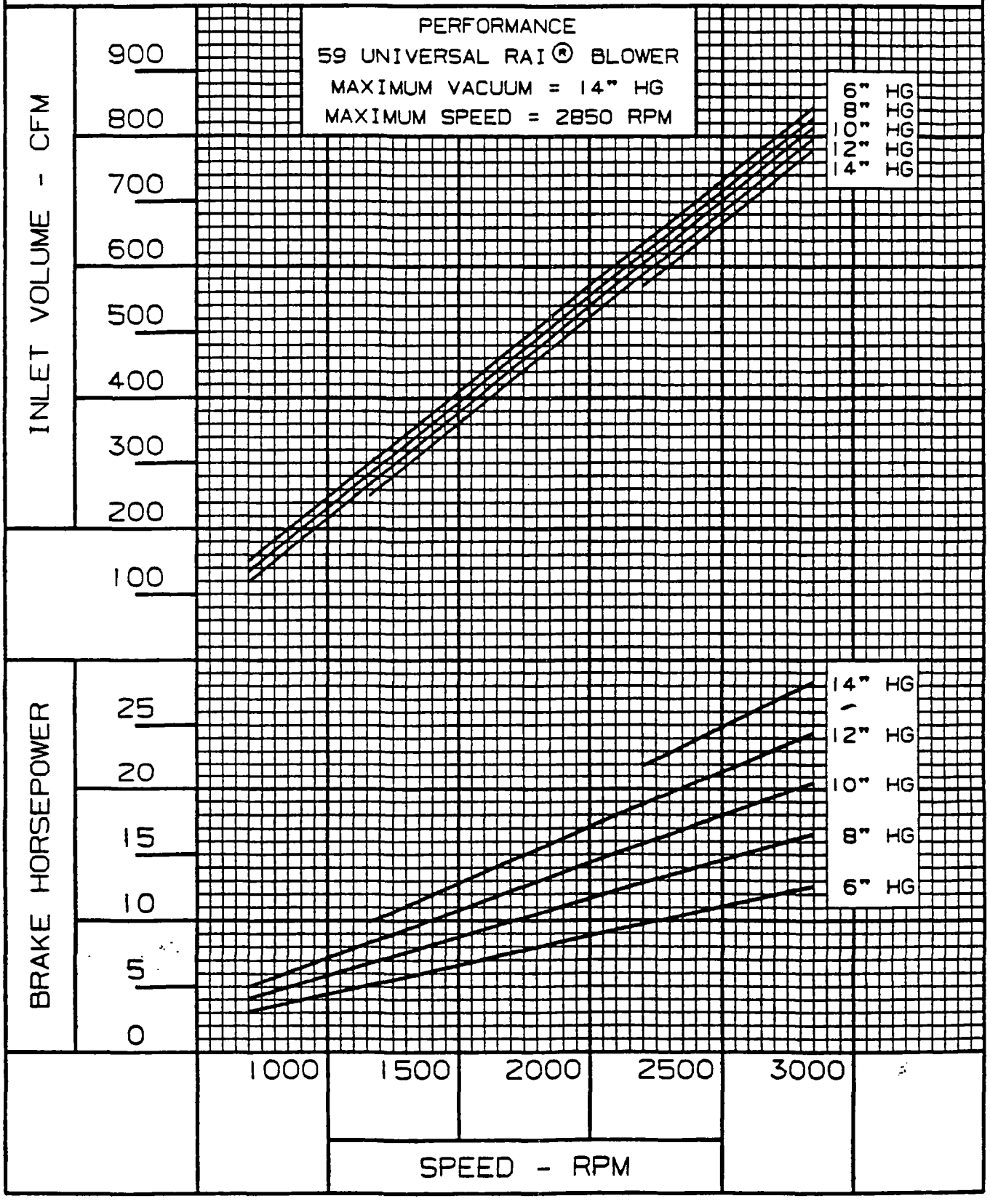
862-796-021

PRINTED IN U.S.A. 62XXAD•M796021

ROOTS DIVISION
DRESSER INDUSTRIES, INC.
CONNERSVILLE, IN. 47331
PRINTED IN U.S.A.

PERFORMANCE BASED ON 68°F
INLET AIR & DISCHARGE
PRESSURE - 30" HG ABS

JUNE 1990



VC-12-59

APPENDIX F

PUMP MAINTENANCE - GW & SVE

GROUND WATER PUMP MAINTENANCE TABLE

START-UP	INITIALS	DATE
Add oil to bearings		
Pack the stuffing box		
Check impeller clearances		
FIRST 200 HOURS		
Change oil		
3 MONTHS OR 3000 HOURS		
Change oil		
Check packing if pump has been idle		
Regrease bearings		
Check foundation & hold down bolts for tightness		
6 MONTHS OR 6000 HOURS		
Change oil		
Check packing if pump hs been idle		
Regrease bearings		
Check foundation & hold down bolts for tightness		
9 MONTHS OR 9000 HOURS		
Change oil		
Check packing if pump hs been idle		
Regrease bearings		
Check foundation & hold down bolts for tightness		
12 MONTHS OR 12000 HOURS		
Change oil		
Check packing if pump has been idle		
Regrease bearings		
Check foundation & hold down bolts for tightness		
Check pump capacity, pressure & power against *specifications*		

Repeat this schedule for every [3 month or 3000 hrs]
NOTE: Initial each task following its completion.

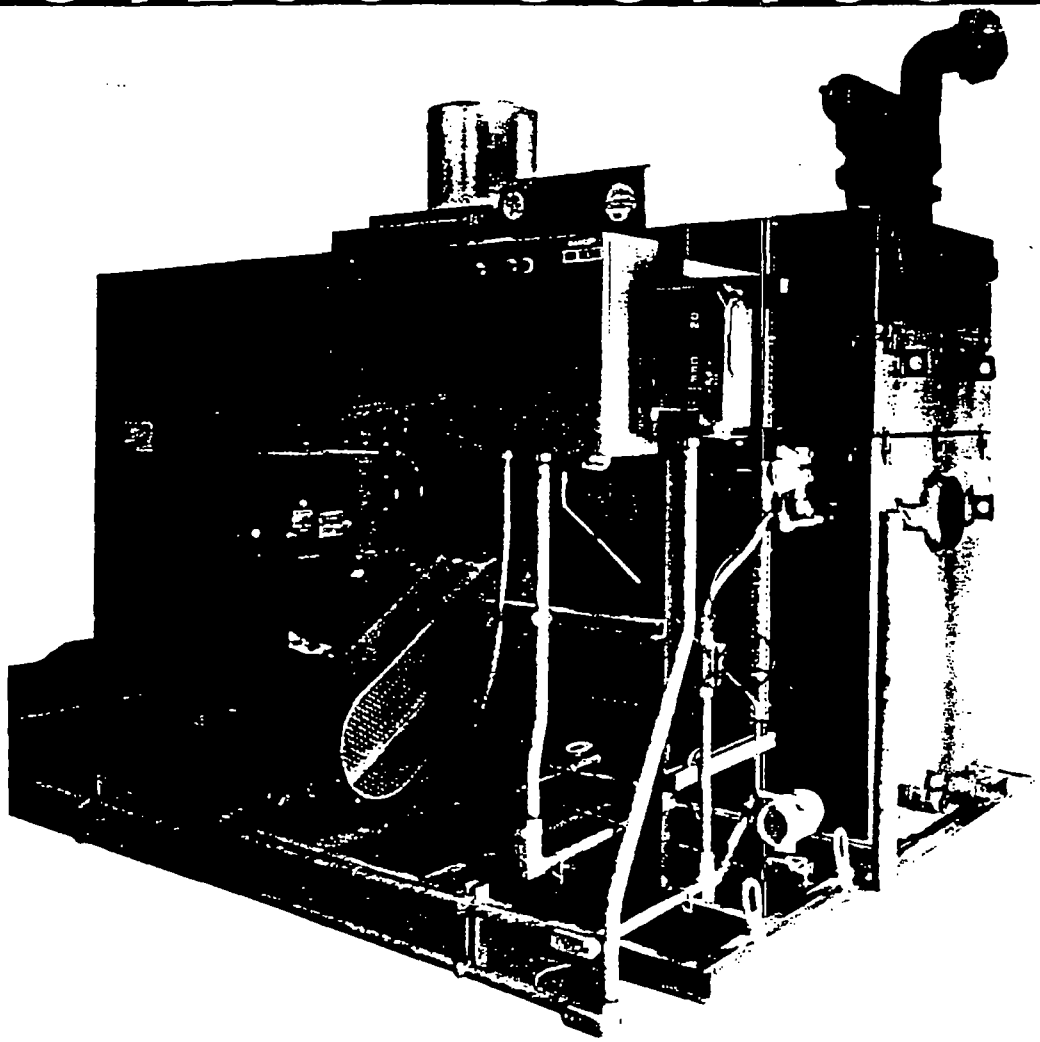
SVE PUMP MAINTENANCE TABLE

START-UP	INITIALS	DATE
Add oil to fill mark		
Change oil every 1000 hours		

APPENDIX G

LOW PROFILE AIR STRIPPER DATA SHEET

31200 Series

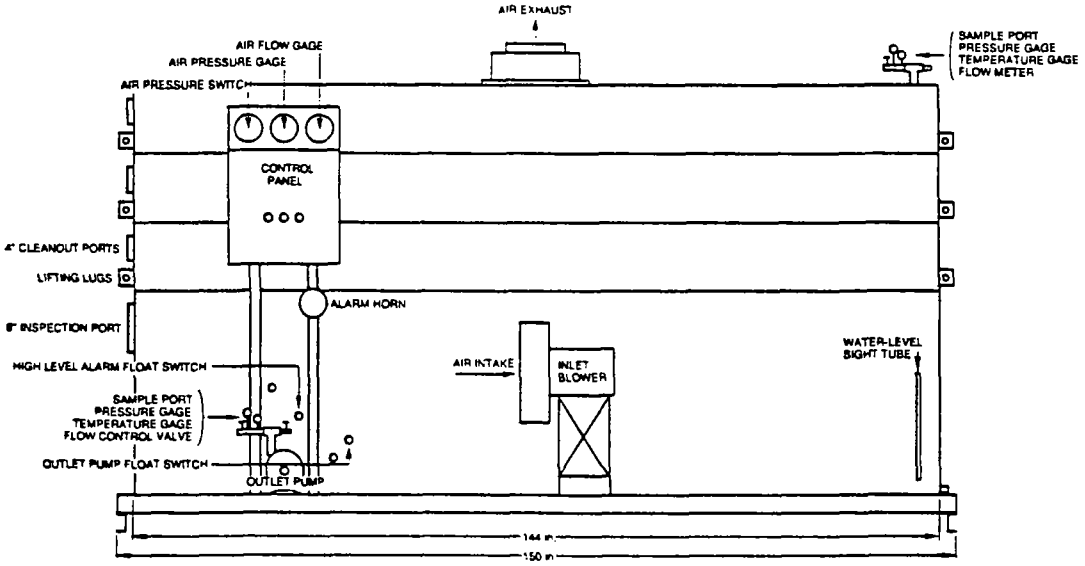


Model Pictured: 31221

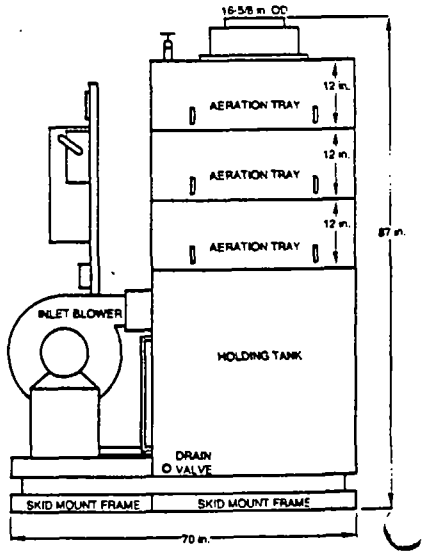
Options chosen for system pictured:

- ☑ NEMA 4 control panel with alarm interlocks, motor starter, relays, 100 db alarm horn
- ☑ Main disconnect switch
- ☑ Low air pressure alarm switch
- ☑ High water level alarm switch
- ☑ Water pressure gauges
- ☑ Line sampling ports

Typical 31231 Configuration*



FRONT VIEW



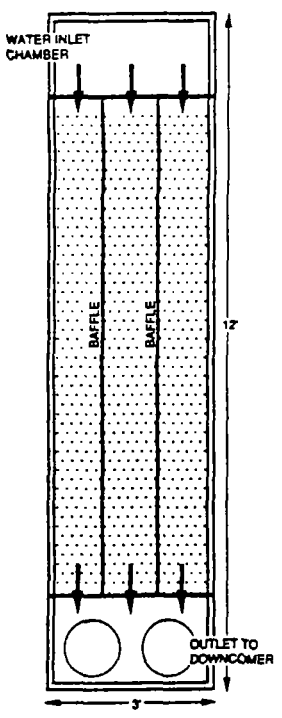
RIGHT SIDE VIEW

*Use these drawings as a guideline only. Systems are built to your project's specifications.

Model	flow rate	# trays	width	length	height	min. cfm	approx. lbs.
31211	1-150gpm	1	5'10"	12'6"	6'3"	1800	2565
31221	1-150gpm	2	5'10"	12'6"	7'3"	1800	2910
31231	1-150gpm	3	5'10"	12'6"	8'3"	1800	3255

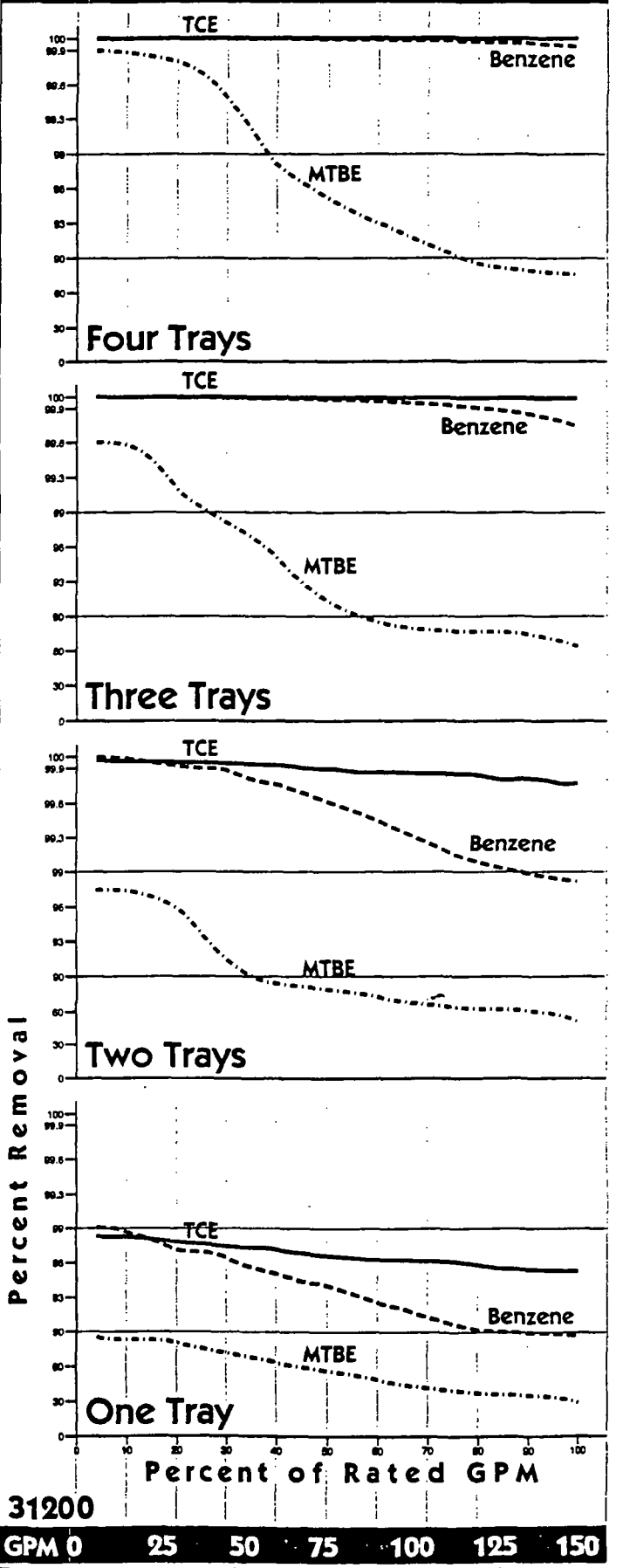
ShallowTray
low profile air strippers

31200 AERATION TRAY



TOP VIEW

Percent Removal vs. Flow Rate



The graphs represent approximate removal efficiencies. Use the ShallowTray™ modeling program to calculate expected performance.

APPENDIX H

LOW PROFILE AIR STRIPPER TROUBLE SHOOTING GUIDE

Problem — Blower Won't Start Or Run

No power to blower

Check that all switches are in "ON" or "AUTO" position.

Position main disconnect switch to "ON" position. Turn control switches to "ON" or "AUTO."

Blown Fuse

Check to see if fuses are ok. Check fuses in main disconnect switch and in control panel.

If blown, replace with fuse of same size and rating.

Overload relay trips

Locate reset button on blower overload relay.

Push reset button in. Reasons for tripping: incorrect line voltage, motor wired incorrectly, inadequate ventilation, bearings are bad.

Tubing to pressure switch plugged with water or debris.

Remove tubing from pressure switch and blow into it towards tank.

Clean or replace tubing if plugged or kinked.

Blower wheel jammed against side of housing.

TURN OFF ALL power to the system. Try to spin wheel by hand. Wheel should rotate freely.

Call North East Environmental Products.

Problem **Low Air Pressure In Stripper Tank**

Blower damper closed.

Visually check position of damper on inlet of blower.

Open damper to get proper reading on pressure gage. Firmly tighten screw.

Motor rotation backwards.

Watch rotation of blower wheel at slow speed.

Reconnect for proper rotation as per motor diagram.

Gravity discharge trap installed incorrectly.

Trap should be positioned vertically as an "upside down U."

Install discharge trap per outlet plumbing drawings provided in appendix A.

Inlet chamber (sealpot) in each tray is not full of water.

Slide tray aside and look at water level in chamber.

Remove 4" rubber caps on end of trays. Fill up inlet chambers with a hose. Or, follow inlet chambers fill up procedure above in Initial Start Up.

Rubber clean out caps not in place.

All cleanout ports must have a rubber cap installed.

Tighten clamp on all rubber caps.

Tubing to pressure gage plugged with water or debris.

Remove tubing from pressure gage and blow into it towards tank.

Clean or replace tubing if plugged or kinked.

Unit has gravity feed, and inlet pipe on inside of ShallowTray cover is not submerged in inlet chamber water.

Remove cover and measure length of piping hanging from inside of cover. Length is to be about 10½" from cover surface.

Adjust length of inlet pipe on inside of cover until total length is about 10½". DO NOT INSTALL NOZZLE ON A GRAVITY FEED UNIT.

Debris blocking blower intake.

Look at blower intake screen.

Remove debris from screen.

Normal operation for automatic unit.

When inlet pump starts, blower will start, air pressure will rise to operational level.

No action necessary.

APPENDIX I

TROUBLESHOOTING CENTRIFUGAL PUMP

Table 7
Troubleshooting Pump

PROBLEM	PROBABLE CAUSE	REMEDY
No liquid delivered.	Pump not primed.	Reprime pump, check that pump and suction line are full of liquid.
	Suction line clogged.	Remove obstructions.
	Impeller clogged with foreign material.	Back flush pump to clean impeller.
	Wrong direction of rotation.	Change rotation to concur with direction indicated by arrow on bearing housing or pump casing.
	Foot valve or suction pipe opening not submerged enough.	Consult factory for proper depth. Use baffle to eliminate vortices.
	Suction lift too high.	Shorten suction pipe.
Pump not producting rated flow or head.	Air leak thru gasket.	Replace gasket.
	Air leak thru stuffing box	Replace or readjust packing/mechanical seal.
	Impeller partly clogged.	Back flush pump to clean impeller.
	Worn suction sideplate or wear rings.	Replace defective part as required.
	Insufficient suction head.	Ensure that suction line shutoff valve is fully open and line is unobstructed.
	Worn or broken impeller.	Inspect and replace if necessary.
Pump starts then stops pumping.	Improperly primed pump.	Reprime pump.
	Air or vapor pockets in suction line.	Rearrange piping to elilminate air pockets.
	Air leak in suction line.	Repair (plug) leak.
Bearings run hot.	Improper alignment.	Re-align pump and driver.
	Improper lubrication.	Check lubricant for suitability and level.
	Lube cooling.	Check cooling system.
Pump is noisy or vibrates.	Improper pump/driver alignment.	Align shafts.
	Partly clogged impeller causing imbalance.	Back-flush pump to clean impeller.
	Broken or bent impeller or shaft.	Replace as required.
	Foundation not rigid.	Tighten hold down bolts of pump and motor or adjust stilts.
	Worn bearings.	Replace.
	Suction or discharge piping not anchored or properly supported.	Anchor per Hydraulic Institute Standards Manual recommendations
	Pump is cavitating.	System problem.
Excessive leakage from stuffing box.	Packing gland improperly adjusted.	Tighten gland nuts.
	Stuffing box improperly packed.	Check packing and repack box.
	Worn mechanical seal parts.	Replace worn parts.
	Overheating mechanical seal.	Check lubrication and cooling lines.
	Shaft sleeve scored.	Remachine or replace as required.
Motor requires excessive power.	Head lower than rating. Pumps too much liquid.	Consult factory. Install throttle valve, cut impeller.
	Liquid heavier than expected.	Check specific gravity and viscosity.
	Stuffing packing too tight.	Readjust packing. Replace if worn.
	Rotating parts bind.	Check internal wearing parts for proper clearances.

APPENDIX J
DRAFT NPDES PERMIT

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

May 13, 1993

Ms. Mary Jane Norville, Esq.
Chair - Medley Farm Site Steering Committee
King & Spalding Law Firm
191 Peachtree Street
Atlanta, GA 30303-1763

RE: NPDES Permit No. SC0046469
Medley Farms NPL Site
Cherokee County

Dear Ms. Norville:

The South Carolina Department of Health and Environmental Control intends to issue a National Pollutant Discharge Elimination System (NPDES) permit to the above-referenced facility in the near future.

The enclosed draft permit shows the proposed conditions to be incorporated as part of the NPDES permit. In order that you understand your responsibilities included in the provisions of this permit, particular attention should be given to the following sections:

1. Part I.A.: This section(s) contains listings of effluent characteristics, discharge limitations, and monitoring requirements. The effective dates for various requirements are listed.

2. Part I.B.: This section contains the schedule of compliance applicable to your facility. If your facility is presently in compliance, no schedule is included. If you have a schedule of compliance, please note Part I.B.2. which contains your responsibilities for reporting compliance requirements.

3. Part I.C.2.: This section contains your responsibilities for reporting monitoring results.

Whether you have specific objections to the draft permit or are satisfied with its conditions, your comments are needed in writing to this office within 30 days. If you have any questions concerning the enclosed conditions or the procedures associated with the permit program, please contact me at the above address or call me at (803) 734-4733.

Sincerely,

Francile S. Shelley

Francile S. Shelley
Environmental Engineer Associate
Industrial & Agricultural Wastewater Division

FSS/pww

Enclosures

cc: Barney Harmon, Appalachia III EQC
SC Appalachian Council of Government
Steve W. Webb, P.E., RMT
Water Quality Monitoring
Robert Wooten, USEPA
Richard Haynes, BSHWM
Billy Britton, BSHWM

South Carolina

DHEC

Department of Health and Environmental Control

Water Pollution Control PERMIT

TO DISCHARGE WASTEWATER IN ACCORDANCE WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

THIS CERTIFIES THAT

Medley Farms NPL Site

has been granted permission to discharge wastewater from a facility located at

Gaffney, Cherokee County
South Carolina

to receiving waters named

Jones Creek

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10 *et seq.*, 1976) and with the provisions of the Federal Clean Water Act (PL 92-500), as amended, 33 U.S.C. 1251 *et seq.*, the "Act."

Marion F. Sadler, Jr.
DIRECTOR, DIVISION OF INDUSTRIAL & AGRICULTURAL WASTEWATER
BUREAU OF WATER POLLUTION CONTROL

Issued:

Expires:

Effective:

Permit No.: SC0046469

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from outfall(s) serial number 001: treated groundwater.

Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	kg/day (lbs/day)		Other Units (Specify)			
	Monthly Average	Daily Max.	Monthly Average	Daily Max.	Measurement Frequency	Sample Type
Flow-m3/day (MGD)	-	-	MR	MR	Continuous	Recordi flow me
1,2-Dichloroethane	-	-	MR	0.028 mg/l	Weekly	Grab
1,1-Dichloroethene	-	-	MR	0.039 mg/l	Weekly	Grab
Tetrachloroethene	-	-	MR	0.072 mg/l	Weekly	Grab
Trichloroethene	-	-	MR	0.028 mg/l	Weekly	Grab
BOD_5	-	-	10 mg/l	20 mg/l	2/Month	Grab

MR = Monitor and Report Results.

2. The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored twice per week by grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts; nor, shall the effluent cause a visible sheen on the receiving waters.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): following treatment but prior to mixing with other waste streams on the receiving water.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

5. During the period beginning on the effective date of this permit and lasting through (See Part III, Special Condition #10) the Permittee is authorized to discharge from outfall serial number 001: treated groundwater.

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS (lbs/day)		Other Units (Specify)		MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
* Biological Monitoring (Whole Effluent Chronic Toxicity Testing)	-	-	-	MR	1/month	Grab

* at IWC of 72 % (See Part III, Special Condition # 10)

6. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at or near the outfall, but prior to mixing with the receiving stream.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

11. During the period beginning (See Part III, Special Condition #10) and lasting through the expiration date the Permittee is authorized to discharge from outfall serial number 001: treated groundwater.

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS (lbs/day)		Other Units (Specify)		MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
Biological Monitoring (Whole Effluent Chronic Toxicity Testing)	-	-	-	0[1]	1/month[1]	Grab

(1) See Part III, Condition #10. a,b,d,e

12. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at or near the outfall, but prior to mixing with the receiving stream.

C. MONITORING AND REPORTING

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be present and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to ensure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than ± 10% from the true discharge rates throughout the range of expected discharge volumes. The primary flow device must be accessible to the use of a continuous flow recorder. Where a flume is present, a separate stilling well for Department/EPA use must be provided if required by the Department.

3. Reporting Monitoring Results

Monitoring results obtained each month shall be reported monthly on a Discharge Monitoring Report Form (EPA Form 3320-1). The first report is due postmarked no later than the 28th day of the month following the month this permit becomes effective. Two copies of these, and all other reports required herein, shall be submitted to the Department:

S.C. Department of Health and Environmental Control
ATTN: BWPC/Enforcement Section
2600 Bull Street
Columbia, South Carolina 29201

4. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to State Environmental Laboratory Certification Regulation 61-81 and Section 304(h) of the Act, as amended. (Federal Register, October 16, 1973; Title 40, Chapter I, Sub-chapter D, Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants." Amended by Federal Register, December 1, 1976, and any other amendments that may be promulgated).

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedules:

N/A

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

5. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. the exact place, date and time of sampling:

b. the dates and times the analyses were performed;

c. the person(s) who performed the analyses and the laboratory certification number where applicable;

d. the analytical techniques or methods used; and

e. the results of all required analyses.

6. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified herein, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA-3320-1). Such increased frequency shall also be indicated. Additional or accelerated monitoring may be required to determine the nature and impact of a non-complying discharge on the environment or to determine if a single non-complying sample is representative of the long term condition (monthly average).

7. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analysis performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Department. The permittee shall furnish to the Department, upon request, copies of records required to be kept by this permit.

8. Definitions

a. The "monthly average", other than for fecal coliform, is the arithmetic mean of all samples collected in a calendar month period. The monthly average for fecal coliform bacteria is the geometric mean of all samples collected in a calendar month period. The monthly average loading is the arithmetic average of all individual loading determinations made during the month.

b. The "weekly average", other than for fecal coliform, is the arithmetic mean of all the samples collected during a one-week period. For self-monitoring purposes, weekly periods in a calendar month are defined as three consecutive seven day intervals starting with the first day of the calendar month and a fourth interval containing seven days plus those days beyond the 28th day in a calendar month. The value to be reported is the single highest of the four weekly averages computed during a calendar month. The weekly average loading is the arithmetic average of all individual loading determinations made during the week.

c. The "daily maximum" is the highest average value recorded of any sample collected during the calendar month.

d. The "instantaneous maximum or minimum" is the highest or lowest value recorded of any sample collected during the calendar month.

e. Arithmetic Mean: The arithmetic mean of any set of values is the summation of the individual values divided by the number of individual values.

f. Geometric Mean: The geometric mean of any set of values is the Nth root of the product of the individual values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

g. Department: The South Carolina Department of Health and Environmental Control.

h. Act: The Clean Water Act (Formerly referred to as the Federal Water Pollution Control Act) Public Law 92-500, as amended.

i. Grab Sample: An individual discrete or single influent or effluent portion of at least 100 milliliters collected at a time representative of the discharge and over a period not exceeding 15 minutes and retained separately for analysis. Instantaneous flow measured at the time of grab sample collection shall be used to calculate quantity.

j. Composite Sample: One of the following four types of composite samples as defined is specified within this permit:

(1) An influent or effluent portion collected continuously over a specified period of time at a rate proportional to the flow.

(2) A combination of not less than 8 influent or effluent grab samples collected at regular (equal) intervals over a specified period of time, properly preserved, (See part I.C.4.) and composited by increasing the volume of each aliquot in proportion to flow. If continuous flow measurement is not used to composite in proportion to flow, the following method will be used: Take an instantaneous flow measurement each time a grab sample is collected. At the end of the sampling period, sum the instantaneous flow measurements to obtain a total flow to determine the partial amount (percentage) of each grab sample to be combined to obtain the composite sample.

(3) A combination of not less than 8 influent or effluent grab samples of equal volume but at variable time intervals that are inversely proportional to the volume of the flow. That is, the time interval between aliquots is reduced as the volume of flow increases.

(4) A combination of not less than 8 influent or effluent grab samples of constant (equal) volume collected at regular (equal) time intervals over a specified period of time, while being properly preserved.

Continuous flow or the sum of instantaneous flows measured and averaged for the specified compositing time period shall be used with composite sample results to calculate quantity.

9. Right of Entry

The permittee shall allow the Commissioner of the Department of Health and Environmental Control, the Regional Administrator of EPA, and/or their authorized representatives:

a. To enter upon the permittee's premises where a regulated facility or activity and effluent source is located in which any records are required to be kept under the terms and conditions of this permit, and,

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under this permit and sample or monitor any substances or parameters at any location of the purposes of assuring permit compliance.

A. GENERAL REQUIREMENTS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit non-compliance constitutes a violation of the Act and the S.C. Pollution Control Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for the denial of a permit renewal application.

2. Civil and Criminal Liability

a. Any person who violates a term, condition or schedule of compliance contained within this permit is subject to the actions defined by Sections 48-1-320 and 48-1-330 of the S.C. Pollution Control Act.

b. Except as provided in permit conditions on "Bypassing" (Part II.C.2.), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for non-compliance.

c. It shall not be an acceptable defense of the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

d. It is the responsibility of the permittee to have a treatment facility that will meet the final effluent limitations of this permit. The approval of plans and specifications by the Department does not relieve the permittee of responsibility for compliance.

3. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under Section 311 of the Act, the S.C. Pollution Control Act or applicable provisions of the S.C. Hazardous Waste Management Act and the S.C. Oil and Gas Act.

4. Permit Modification

a. The permittee shall furnish to the Department within a reasonable time any relevant information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit, or to determine compliance with the permit.

b. Upon sufficient cause, this permit may be modified, revoked, reissued, or terminated during its term, after public notice and opportunity for a hearing. Modifications deemed to be minor will not require public notice.

c. The filing of a request by the permittee for a permit modification, or a notification of planned changes or anticipated non-compliance, does not stay any permit condition.

5. **Toxic Pollutants**

Notwithstanding Part II.A.4. above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitations for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and permittee so notified.

6. **State Laws**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

7. **Property Rights**

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

8. **Severability**

The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

9. **Onshore and Offshore Construction**

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

B. REPORTING REQUIREMENTS

1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any planned facility expansions, production increases, or process modifications which will result in a new or different discharge of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the Department of such changes. Following such notice, the permit may be modified to specify and limit any pollutant not previously limited.

2. Twenty-Four Hour Non-Compliance Reporting

a. The permittee shall report any non-compliance with provisions specified in this permit which may endanger public health or the environment. The permittee shall notify the Department orally within 24 hours of becoming aware of such conditions. During normal working hours call 803/734-5300. After hour reporting should be made to the 24 hour Emergency Response telephone number 803/253-6488. The permittee shall provide the following information to the Department in writing, within five (5) days of becoming aware of such conditions:

   1. A description of the discharge and cause of non-compliance; and,

   2. The period of non-compliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the non-complying discharge.

b. The following violations shall be included in a 24 hour report when they might endanger health or the environment:

   1. An unanticipated bypass which exceeds any effluent limitation in this permit;

   2. Any upset which exceeds any effluent limitation in the permit.

c. As soon as the permittee has knowledge of or anticipates the need for a bypass, but not later than 10 days before the date of the bypass, it shall notify the Department and provide a determination of the need for bypass as well as the anticipated quality, quantity, time of duration, and effect of the bypass.

3. **Other Non-Compliance**

The permittee shall report in narrative form, all instances of non-compliance not previously reported under Section B, Paragraph B.2., at the time Discharge Monitoring Reports are submitted. The reports shall contain the information listed in Paragraph B.2.a.

4. **Transfer of Ownership or Control**

A permit may be transferred to another party under the following conditions:

a. The permittee notifies the Department of the proposed transfer at least thirty (30) days in advance of the proposed transfer date;

b. A written agreement is submitted to the Department between the existing and new permittee containing a specific date for the transfer of permit responsibility, coverage, and liability for violations up to that date and thereafter.

Transfers are not effective if, within 30 days of receipt of proposal, the Department disagrees and notifies the current permittee and the new permittee of the intent to modify, revoke and reissue, or terminate the permit and to require that a new application be filed.

5. **Expiration of Permit**

The permittee is not authorized to discharge after the expiration date of this permit, unless a completed application for reissuance is submitted no later than 180 days prior to the expiration date. Permission may be granted to submit an application later than this, but not later than the expiration date of the permit. In accordance with Section 1-23-370 of the code of laws of South Carolina, if a timely and sufficient application is made for any activity of a continuing nature, the existing permit does not expire until a final determination is made to renew or deny renewal of the existing permit.

6. **Signatory Requirements**

All applications, reports or information submitted to the Department shall be signed and certified.

a. All permit applications shall be signed as follows:

1. For a corporation: by a principal executive officer of at least the level of vice-president or by a duly authorized representative;

2. For a partnership or sole proprietorship: by a general partner or proprietor, respectively; or,

3. For a municipality, State, Federal or other public agency: by either a principal executive officer or ranking elected official.

b. All reports required by the permit and other information requested by the Department shall be signed by a person described above or by duly authorized representation only if:

1. The authorization is made in writing by a person described above and submitted to the Department;

2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

7. **Availability of Reports**

Except for data determined to be confidential under Section 48-1-270 of the S.C. Pollution Control Act, all reports prepared in accordance with the terms and conditions of this permit shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 48-1-340 of the S.C. Pollution Control Act.

8. **Changes in Discharges of Toxic Pollutants or Hazardous Substances**

a. The permittee shall notify the Department as soon as it knows or has reason to believe that any activity has occurred or will occur which would result in the discharge in any outfall of:

1. Any toxic pollutant(s) identified under Section 307(a) of the Act which exceed the highest of the following concentrations and are not limited in the permit.

- 1 mg/l for antimony (Sb):
- 0.500 mg/l for 2,4-dinitrophenol or 2-methyl, -4,6-dinitrophenol;
- 0.200 mg/l for acrolein or acrylonitrile;
- 0.100 mg/l for any other toxic pollutant; or,
- Ten (10) times the maximum concentration value reported in the permit application.

2. Any hazardous substance(s) identified under Section 311 of the Act as determined by Federal Regulation 40 CFR 117.

b. The permittee must notify the Department as soon as it knows or has reason to believe that it has begun or expects to begin to use or manufacture as an intermediate or final product or by-product any toxic pollutant or hazardous substance which was not reported in the permit application.

C. OPERATION AND MAINTENANCE

1. Facilities Operation

a. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance based on design facility removals, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls as determined by the laboratory certification program of the Department. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit. Maintenance of facilities, which necessitates unavoidable interruption of operation and degradation of effluent quality shall be scheduled during non-critical water quality periods and carried out in a manner approved by the Department.

b. The permittee shall provide for an operator, as certified by the South Carolina Board of Certification for Environmental Systems Operators, with a grade equal to or higher than the classification designated in Part III.A.3. The name and grade of the operator of record shall be submitted to the Department prior to placing the facility into operation. A roster of operators associated with the facility's operation and their certification grades shall also be submitted with the name of the "operator-in-charge". Any changes in operator or operators shall be submitted to the Department as they occur.

2. Bypassing

Any intentional diversion from or bypass of waste streams from any portion of wastewater collection and treatment facilities which is not a designed or established operating mode for the facility is prohibited except (a) where unavoidable to prevent loss of life, personal injury or severe property damage, or (b) where excessive storm drainage or run-off would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit and there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities or retention of untreated wastes. "Severe property damage" does not mean economic loss caused by delays in production.

3. **Duty to Mitigate, Halt or Reduce Activity**

The permittee shall take all reasonable steps to prevent, minimize or correct any adverse impact on public health or the environment, resulting from non-compliance with this permit. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with this permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided.

4. **Power Failures**

In order to maintain compliance with effluent limitations and prohibitions of this permit, the permittee shall either:

a. In accordance with the Schedule of Compliance contained in Part I.B., provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I.B., have a plan of operation which will:

b. Halt, reduce, or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

5. **Removed Substances**

Solids, sludges, filter backwash or other residuals removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent such materials from entering State waters and in accordance with guidelines issued pursuant to Section 405 of the Act, and the terms of a construction or NPDES and/or solid or hazardous waste permit issued by the Department.

PART III

A. OTHER REQUIREMENTS

1. The permittee shall maintain at the permitted facility a complete Operations and Maintenance Manual for the waste treatment plant. The manual shall be made available for on-site review during normal working hours. The manual shall contain operation and maintenance instructions for all equipment and appurtenances associated with the waste treatment plant. The manual shall contain a general description of the treatment process(es), operating characteristics that will produce maximum treatment efficiency and corrective action to be taken should operating difficulties be encountered.

2. The permittee shall provide for the performance of routine daily treatment plant inspections by a certified operator of the appropriate grade as defined in Part II.C.1. The inspection shall include, but is not limited to, areas which require a visual observation to determine efficient operations and for which immediate corrective measures can be taken using the O & M manual as a guide. All inspections shall be recorded and shall include the date, time and name of the person making the inspection, corrective measures taken, and routine equipment maintenance, repair, or replacement performed. The permittee shall maintain all records of inspections at the permitted facility as required by Part I.C.7., and the records shall be made available for on-site review during normal working hours.

3. The wastewater treatment plant shall be assigned a classification in the Permit to Construct to be issued by the Department. Treatment systems must be completed and installed prior to beginning of discharge.

4. The permittee shall maintain an all weather access road to the wastewater treatment plant and appurtenances at all times.

5. The permittee shall monitor all parameters consistent with conditions established by this permit on the 2nd Monday of every calendar month, unless otherwise approved by this Department. Additional monitoring, as necessary to meet the frequency requirements of this permit (Part I.A. Effluent Limitations and Monitoring Requirements) shall be performed by the permittee.

6. The permittee shall maintain at the permitted facility a record of the method(s) used in "estimating" the discharge flow (i.e., pump curves, production charts, water use records, etc.). Records of any necessary calibrations must also be kept. This information shall be made available for on-site review by Department personnel during normal working hours.

7. Disposal of all sludge and waste oils shall meet all requirements of SCDHEC's Bureau of Solid and Hazardous Waste Management.

8. The NPDES permit limitations are considered <u>provisional</u> until the appropriate basin-wide NPDES permitting activity has been completed. These limits are subject to change at that time.

9. The application for a Permit to Construct shall include plans and specification for an in-stream diffuser for the discharge of the effluent to Jones Creek. Such diffuser must be installed and ready for use prior to initiation of any discharge.

10. (a) On a monthly basis, a three-brood chronic toxicity test shall be conducted using a control and the instream waste concentration (IWC) of 72 %. The test shall be conducted using Ceriodaphnia dubia as the test organism and in accordance with the most recent "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms" (EPA/600/5-89/01) and "South Carolina Procedures for Pass/Fail Modifications of the Ceriodaphnia 48 hour Acute Toxicity Test and Ceriodaphnia Survival and Reproduction Test" (SCDHEC, May 1989). The raw data and results shall be submitted in accordance with Part I.(C)(3) of the permit for each monthly test. The test must be performed by a DHEC certified laboratory.

(b) If the test results indicate a significant difference in Ceriodaphnia dubia survival and/or reproduction between the control and instream waste concentration at the 95% confidence level (p=0.05), the test shall be deemed a failure.

(c) If a test fails, a toxicity evaluation plan shall be submitted to the Enforcement Section of the Bureau of Water Pollution Control within sixty (60) days of notification to the Department of test results.

(d) The permittee must indicate on the discharge monitoring report form whether the test passes or fails. If the test fails, the number "1" shall be placed on the form; if the test passes, the number "0" shall be placed on the form.

(e) Twelve consecutive acceptable months of toxicity testing results may result in quarterly testing in lieu of monthly tests at the Department's discretion.

11. After twelve consecutive months of "passed" toxicity testing results, the Department may terminate the screening process and impose a limitation. Page 4 of this permit shall become effective and Page 3 shall expire on the first day of the month after the Department informs the permittee in writing.

12. A 2C NPDES Application Form shall be completed and submitted to SC DHEC within 120 days of the initial discharge of treated groundwater. The permittee shall analyze for all parameters in Item V. , Parts A, B, and C. Significant variation from anticipated levels of pollutants present may result in this permit being modified or revoked and reissued to incorporate additional parameters and limitations.

Rationale/FSS
NPDES Permit No. SC0046469
Medley Farms Site

I. General Information

The wastewater from this project will be generated from the clean-up of contaminated groundwater from the Medley Farm Site in Cherokee County. The design of the remediation system is based on a maximum flow rate of 152.77 gpm (0.22 MGD). This treated water will be piped to Jones Creek for discharge. Jones Creek will be considered a FW (Freshwater) Class Stream.

Determination of Limitations

7Q10 of Jones Creek = 0.13 cfs (0.084 MGD)
Q_A of Jones Creek = 1.6 cfs (1.034 MGD)
Q_D (Effluent Discharge Flow) = 0.22 MGD
Dilution Factor for Aquatic Life (DF_1) =

$$\frac{7Q10 + Q_D}{Q_D} = \frac{0.084 + 0.22}{0.22} = 1.38$$

Dilution Factor for MCLs and Human Health (DF_2) =

$$\frac{Q_A + Q_D}{Q_D} = \frac{1.034 + 0.22}{0.22} = 5.7$$

Instream Waste Concentration for Aquatic Life (IWC_1) =
$1/DF_1 \times 100\ \% = 72.37\ \%$

Instream Waste Concentration for MCLs and Human Health (IWC_2) = $1/DF_2 \times 100\ \% = 12.22\%$

Allowable Discharge Concentration = Acceptable Instream Concentration x Dilution Factor

Discharge limitations are considered for those regulated pollutants found to be present in the groundwater. Limitations are based on EPA Water Quality Criteria for Aquatic Life (WQC) and Human Health (HH) consideration, whichever are more stringent. Where applicable, Drinking Water Maximum Contaminant Levels (MCLs) are used. In any instance where the State's lower limit of detection is below the limits, the applicable limitation will be stated as "less than (<)" the detection limit.

II. Permit Limitations :

A. Benzene
1. Sampling Results: 2.0 ug/l
2. Drinking Water MCLs: 5 ug/l
3. WQC (Aquatic Life): (5,300 ug/l ÷ 100) x DF_1(1.38) = 73.14 ug/l
4. WQC (Human Health): 5 ug/l x DF_2(5.7) = 28.5 ug/l
5. State Lower Limit of Detection: 2.0 ug/l
6. Conclusion: Due to effluent concentrations resulting in less than one-tenth the most stringent stream standards, there will be no limit for Benzene.

B. Chloroform
1. Sampling Results: 9 ug/l
2. Drinking Water MCLs: 100 ug/l
3. WQC (Aquatic Life): (1240 ÷ 10) x DF_1(1.38) = 171.12 ug/l
4. WQC (Human Health): 100 ug/l x DF_2(5.7) = 570.0 ug/l
5. State Lower Limit of Detection: 2.0 ug/l
6. Conclusion: Due to effluent concentrations resulting in less than one-tenth the most stringent stream standards, there will be no limit for Chloroform.

C. 1,1-Dichloroethane
1. Sampling Results: 5 ug/l
2. Drinking Water MCLs: none
3. WQC (Aquatic Life): none
4. WQC (Human Health): none
5. State Lower Limit of Detection: 2.0 ug/l
6. Conclusion: In the absence of any State standards, and the low concentrations present, there will be no limit for 1,1- Dichloroethane.

D. 1,2-Dichloroethane
1. Sampling Results: 650 ug/l
2. Drinking Water MCLs: 5 ug/l
3. WQC (Aquatic Life): (118,000 ÷ 100) x DF_1(1.38) = 1628.4 ug/l
4. WQC (Human Health): 5 ug/l x DF_2(5.7) = 28.5 ug/l
5. State Lower Limit of Detection: 5 ug/l
6. Conclusion: The limit for 1,2-Dichloroethane will be 28.5 ug/l, based on Water Quality Standards (Drinking Water MCL)

E. 1,1-Dichloroethene
1. Sampling Results: 400 ug/l
2. Drinking Water MCLs: 7 ug/l
3. WQC (Aquatic Life): (11,600 ÷ 100) x DF_1(1.38) = 160.08 ug/l
4. WQC (Human Health): 7 ug/l x DF_2(5.7) = 39.9 ug/l
5. State Lower Limit of Detection: 5 ug/l
6. Conclusion: The limit for 1,1-Dichloroethene will be 39.9 ug/l, based on Water Quality Standards (Drinking Water MCL)

F. 1,2-trans-Dichloroethane
1. Sampling Results: 37 ug/l
2. Drinking Water MCLs: none
3. WQC (Aquatic Life): none
4. WQC (Human Health): none
5. State Lower Limit of Detection:
6. Conclusion: In the absence of any state standard and the low concentrations present, there will be no limit for 1,2-Dichloroethane.

G. Tetrachloroethene
1. Sampling Results: 560 ug/l
2. Drinking Water MCLs: 88.5 ug/l
3. WQC (Aquatic Life): (5,280 ÷ 100) x DF_1(1.38) = 72.86 ug/l
4. WQC (Human Health): 88.5 x DF_2(5.7) = 504.45 ug/l
5. State Lower Limit of Detection: 2 ug/l
6. Conclusion: The limit for Tetrachloroethene will be 72.8 ug/l based on Water Quality Criteria (Aquatic Life)

H. 1,1,1-Trichloroethane
1. Sampling Results: 61 ug/l
2. Drinking Water MCLs: 200 ug/l
3. WQC (Aquatic Life): none
4. WQC (Human Health): 200 ug/l x DF_2(5.7) = 1,140 ug/l
5. State Lower Limit of Detection: 2 ug/l
6. Conclusion: Due to effluent concentrations resulting in less than one-tenth the most stringent stream standards, there will be no limit for 1,1,1-Trichloroethane.

I. Trichloroethene (TCE)
1. Sampling Results: 920 ug/l
2. Drinking Water MCLs: 5 ug/l
3. WQC (Aquatic Life):(45,000 ÷ 100) x DF_1(1.38) = 621.0 ug/l
4. WQC (Human Health): 5 ug/l x DF_2(5.7) = 28.5 ug/l
5. State Lower Limit of Detection: 2 ug/l
6. Conclusion: The limit for Trichloroethene will be 28 ug/l based on Water Quality Criteria (Drinking Water MCL)

J. BOD_5
1. Sampling Results: <10 mg/l
Wasteload Allocation Section recommendations:
Daily Maximum: 20 mg/l
Monthly Average: 10 mg/l
2. Conclusion: Based on water quality considerations, BOD will be limited to 10 mg/l as monthly average and 20 mg/l as daily maximum.

K. pH
Regulation 61-68, Water Classifications and Standards, sets pH standard for Freshwaters between 6.0 and 8.5

SUMMARY OF LIMITS

Pollutant	Proposed Limitation
1,2-Dichloroethane	28.5 ug/l (0.028 mg/l)
1,1- Dichloroethene	39.9 ug/l (0.039 mg/l)
Tetrachloroethene	72.8 ug/l (0.072 mg/l)
Trichloroethene	28.5 ug/l (0.028 mg/l)
BOD_5	10 mg/l (Monthly Average)
	20 mg/l (Daily Maximum)
pH	6.0 to 8.5

L. The Department's Toxic Control Strategy for Wastewater Discharges requires only chronic toxicity testing for IWC's between 10% and 80% when an instream diffuser instream diffuser is in place. Since the special conditions section of the permit calls for an instream diffuser to be installed, only chronic toxicity testing is being required.

If no failures occur during the year's screening process, a limitation for biological monitoring may be imposed and the frequency of testing may be reduced to once per quarter.